AUGUST, 1926

Railway Engineering and Maintenance

The Peak of Perfection

THE superimposed curves on the normal spiral give IMPROVED HIPOWER the enormous stored reactive power which forces the joint bars tightly against the rail at all times.

This continuous tightness assures top notch economy and safety because it protects against loose joints, bolt breakage and battered rail ends and angle bars.

The National Lock Washer Co.
NEWARK, N. J., U. S. A.

HIPOWER

HY-CROME

Spring Washers

HY-CROME confidence is based on performance exemplified by their permanent resistance against spring fatigue — an exclusive, Hy-Crome characteristic that guarantees rail joint security at lower maintenance cost per year.

THE RELIANCE MFG. CO.
MASSILLON, OHIO

NEW YORK, CLEVELAND, DETROIT, CHICAGO, ST. LOUIS, SAN FRANCISCO

N. S. Kenney, Munsey Bldg., Baltimore, Md.
Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada

RAILWAY ENGINEERING AND MAINTENANCE
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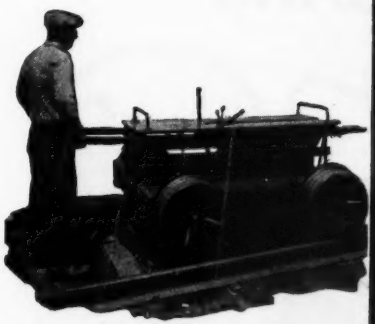
For all inspection work



Easily handled by one man
Total weight 490 pounds.
Lifting weight 140 pounds.

Motor
4 H. P., water cooled, free running

Cooling
New thermo-syphonic design water hopper

Transmission
Chain drive, multiple disc clutch

Skids
Standard equipment

The New Mudge "Inspector" Class "B-2" Motor Car

BUILT for continuous all day service the new Class "B-2" has been welcomed alike by road-masters, supervisors, signal maintainers, telegraph linemen and inspectors. You will appreciate its splendid riding qualities. The sturdy motor is in a class in itself. It idles perfectly. Ample protection against heating of motor is provided by the Mudge thermo-syphonic water hopper.

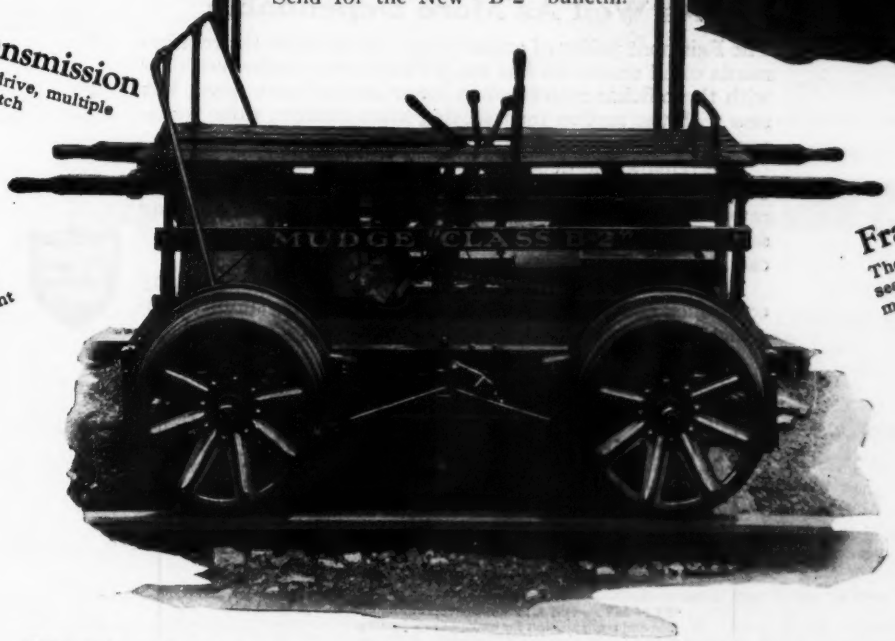
The well known high standards of Mudge materials and workmanship make the Mudge Class "B-2" unexcelled for general inspection service.

Send for the New "B-2" bulletin.

Brakes
New design, four-wheel, positive and quick acting

Bearings
Roller bearings on both crank shaft and wheels

Comfortably seats four men



Frame
Thoroughly seasoned maple

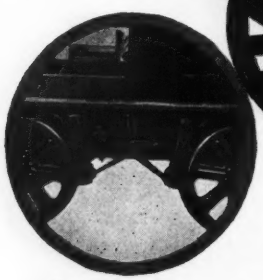
Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

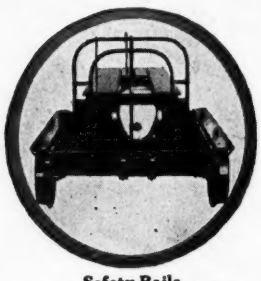
Fairmont
RAILWAY MOTOR CARS

No Pushing to Start
and no dangerous scrambling to get on! The Fairmont starts under its own power even with full load.

For Quick Removal
The Fairmont is ruggedly constructed yet light in weight—Easy grip lift levers insure quick removal from track.



Four Wheel Brakes
Sudden stops can be made in shorter distances—each car is fitted with four wheel brakes, operated by powerful toggles.



Safety Rails
Each Fairmont is standard equipped with foot and safety rails extending the length of the car.

SAFER
As Well As More Dependable

The Fairmont policy of engineering a car to meet the requirements of all concerned has made Fairmonts popular not only with the officials interested in lower maintenance costs, but also with the section men seeking more reliable, safer transportation.

The remarkable dependability of the Fairmont in moving every load however big is, for the entire crew a constant inspiration to greater effort. They also find in the Fairmont's many safety features a feeling of security not experienced on other cars.

The increased efficiency resulting together with the many economies effected by the Fairmont's stronger, simpler construction have made Fairmont Railway Motor Cars the choice

Performance on the Job Counts

FAIRMONT RAILWAY MOTOR CARS		
M19	M14	*S2 *M2 *A2
Inspection Car for one man to four men.	Light Section Car for gangs up to six men.	Section Cars. Seating capacities from eight to twelve men. Pulling capacities up to fifty men.

*ST2—MT2—and AT2 are corresponding models equipped with 2 speed transmission for extra heavy pulling.

FAIRMONT RAILWAY MOTORS, INC.
FAIRMONT MINNESOTA

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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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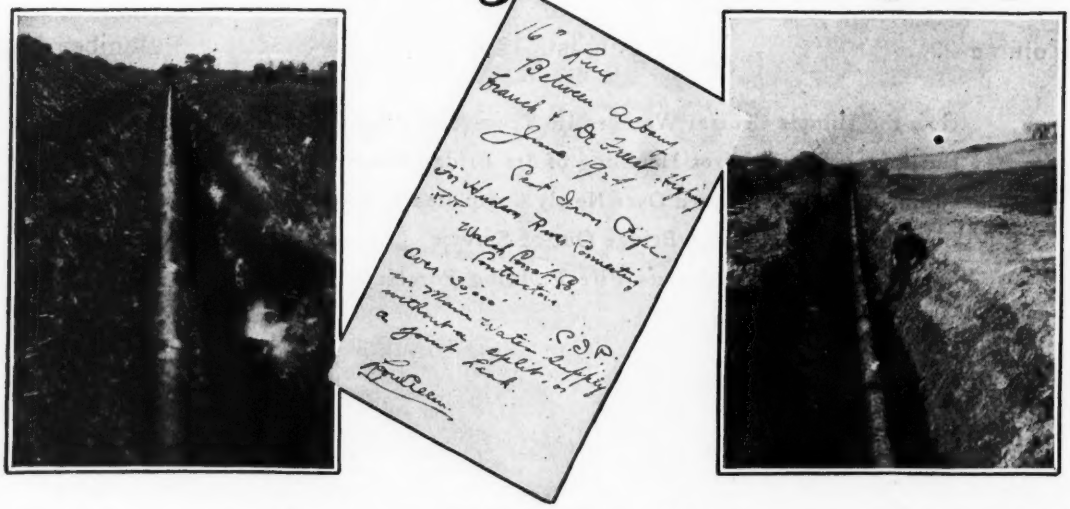
On The Back of A Photograph



Mr. Lou Allen, superintendent for the Walsh Construction Company, in the building of the Water Supply System for the Hudson River Connecting R. R. at Selkirk, New York, summed up the experience of many users of Cast Iron Pipe when he wrote on the back of the photograph shown at the right:

"Over 30,000 feet of Cast Iron Pipe in Main Water Supply without a split or joint leak."

Users of Cast Iron Pipe expect little or no trouble from it, either in the laying or after the pipe is in the ground. The Bell and Spigot Joint goes together easily in the field, is tight, yet flexible, and each joint is equally strong.

The wide range of standard fittings and the adaptability of the joint itself make it simple to meet any construction conditions.

Major raises or drops, or sudden changes of direction can easily be accomplished by the use of the standard fittings.

Services or smaller lines can be put in anywhere. The joint itself is sufficiently flexible to take care of the ordinary ups and downs of pipe line construction.

Even easy curves can be made by the use of the standard Bell and Spigot pipe.

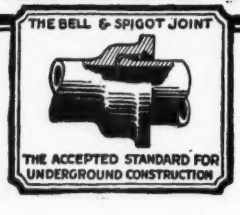
Once in the ground, the pipe is good for many, many years. Writing it off on a basis of a life of 100 years is considered conservative practice. It is probable that time will show that the scientifically made Cast Iron Pipe of the present will have a useful life measured in centuries.

This Bureau is organized to assist you in any pipe line problem that may arise. This service is available without obligation.

Address: RESEARCH ENGINEER
CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

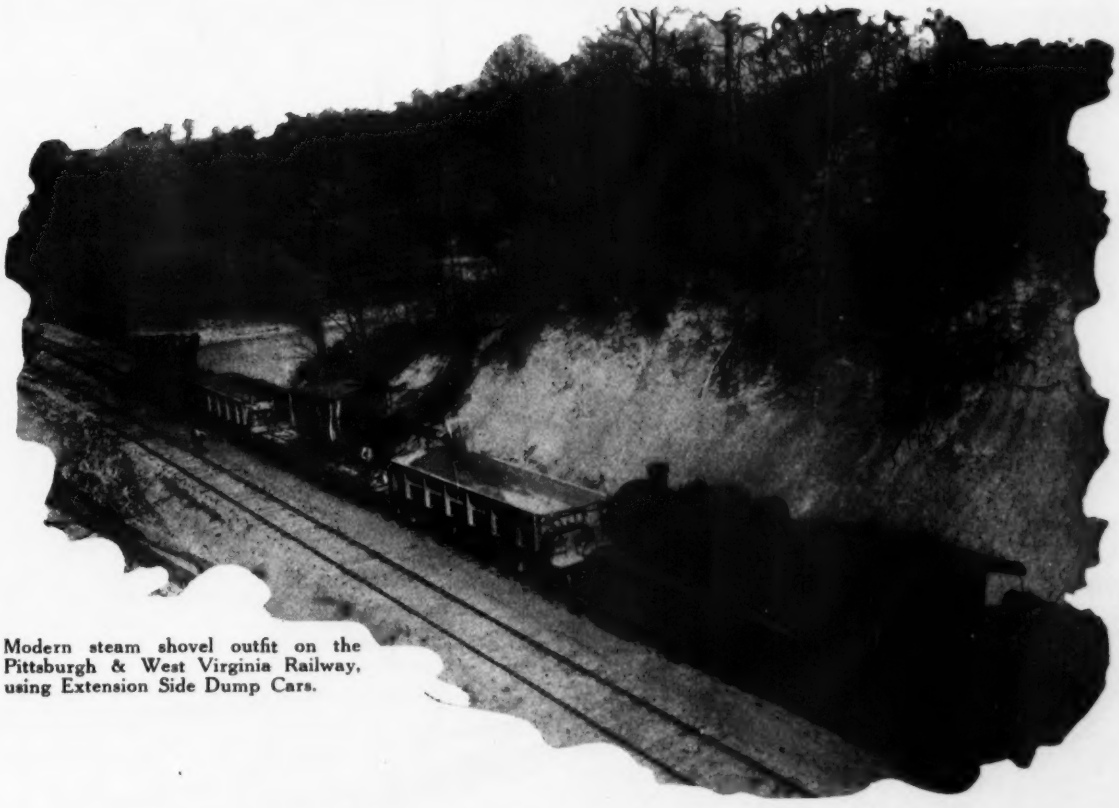
CAST IRON PIPE

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request



Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

ONE PRINCIPLE FOR TWENTY YEARS



Modern steam shovel outfit on the Pittsburgh & West Virginia Railway, using Extension Side Dump Cars.

OVER THE TRACK QUICKLY WITH LESS LABOR

STEAM SHOVEL or ditcher for loading, and air operated Extension Side Dump Cars for dumping, make the ideal combination for efficient and economical maintenance of track. Loading is done quickly, but more important, unloading is practically instantaneous.

Extension Side Dump Cars prevent traffic delays—they operate upon a principle which assures constant balance throughout the dumping operation. The car body rolls easily to full dump position, with minimum requirement of air even under extreme conditions of load and track. The entire load is discharged over the down turned door beyond the train clearance in a few seconds without labor.

CLARK CAR COMPANY
BALANCED DOOR DUMP CARS
PITTSBURGH, PA.

PITTSBURGH

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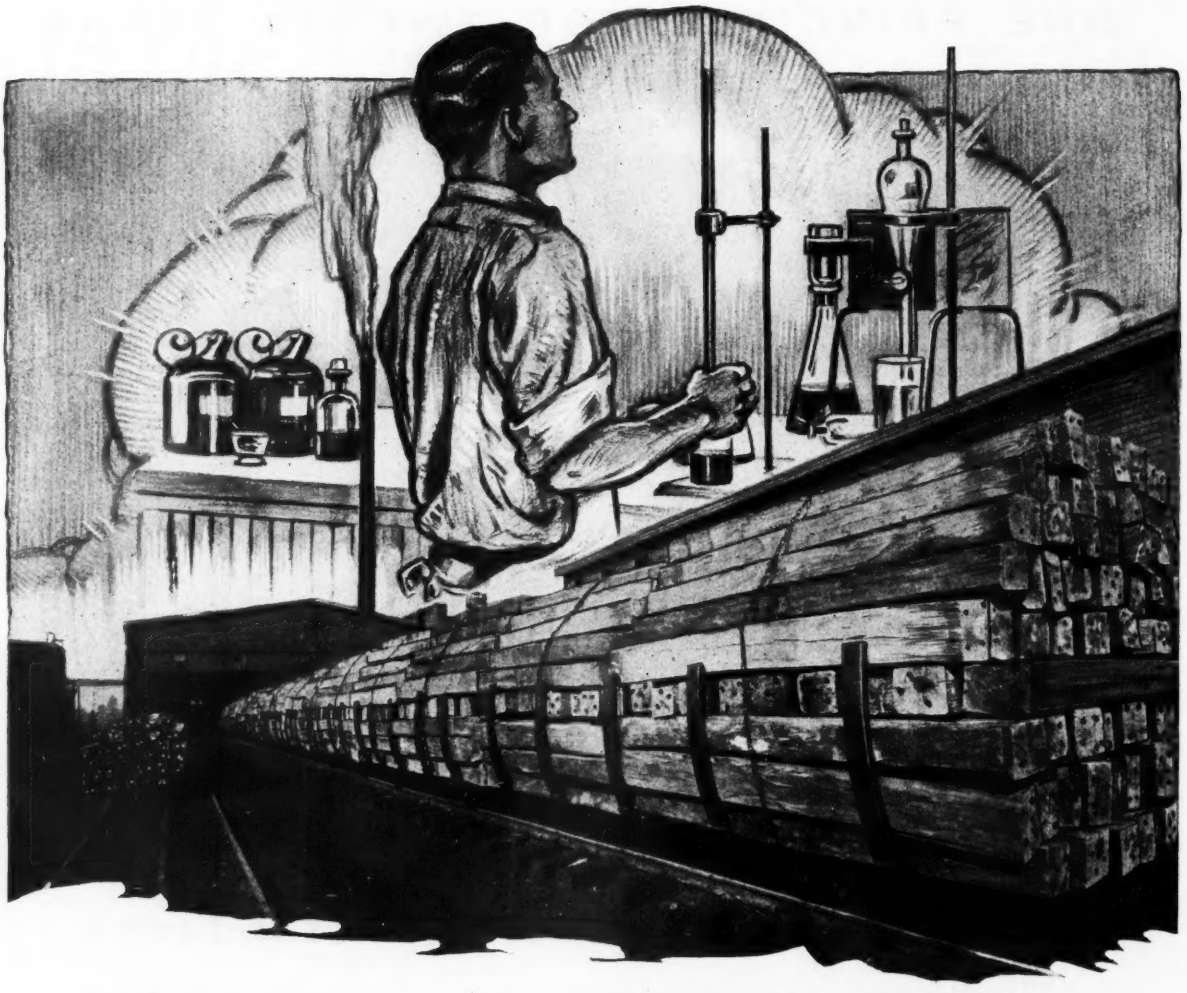
CLARK CARS
EXTENSION SIDE DUMP



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EXACTING watchfulness, rigidly enforced specifications tirelessly maintained have made possible the high and uniform quality of ***International*** ties.

International ties are watched constantly—***in the woods*** during production, ***at the plant,*** during seasoning and again when loaded ***on trams*** for treatment. Any tie with the least indication of decay is removed and destroyed. Preservatives and treatments are under exacting control of our Department of Chemistry and Tests. Only high grade creosote oil—A. R. E. A. grade 1· is used, and the full quantity of oil you specify stays in the ties.

These high quality ties are ready for shipment NOW.

International Creosoting & Construction Co.

General Offices—Galveston, Texas

International

STANDARD SPECIFICATION TIES

Would you care to discuss this matter?

Our metallurgists have been discussing failures of steel parts in locomotives—engine bolts and staybolts for instance—with many important railroad executives. They have gathered a great deal of interesting information on the use of alloy steels in the reduction of these failures. Our metallurgists would like to discuss this matter with you.

INTERSTATE IRON & STEEL CO.
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CHICAGO

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Wire Rods, Wire, Nails, Rivets and Cut Tacks
Iron Bars and Railroad Tie Plates

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SAVE 60% OF YOUR LABOR AND TOOL COST

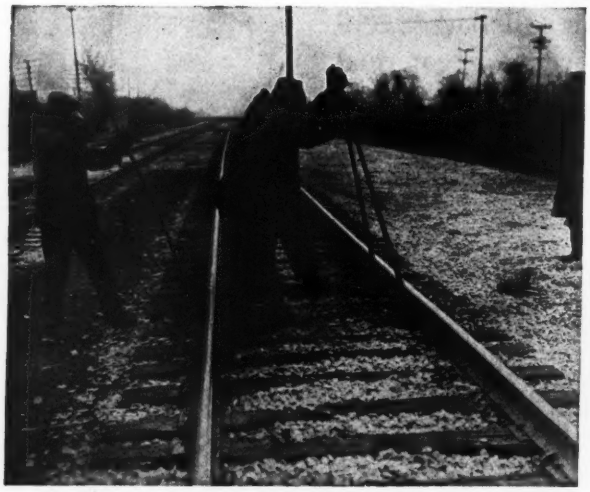
now in use on over

100 RAILROADS

Note the Two Step Feature at the top of base. 3 to 5 men can now do the work of 7 to 9 men. 7 men can do the work of 15 to 20 men.

Hackmann Combination Track Liner
Weight 20 lb.

You can make at least two pulls without resetting the liner. No digging necessary.

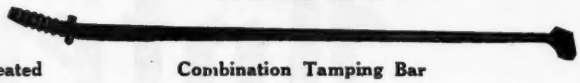


Showing Bar Set in Bottom Notch for First Throw

Showing Bars Set in Upper Notch for Second Throw

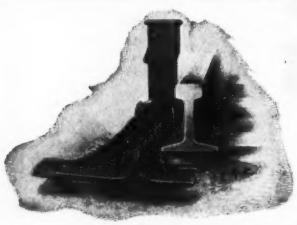
Combination Lining Bar

Heat Treated

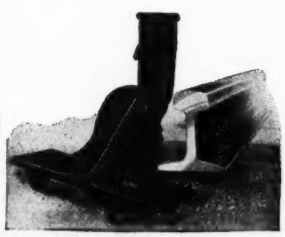


Combination Tamping Bar

Why buy lifting type track liners for just moving track when you can use the Hackmann Track Liners for Lining Track, Frogs and Switches, Raising Low Joints and Spacing Ties. Can be operated against the end of track or switch ties where one rail is free.
You can make at least two pulls without resetting.
All Hackmann and Idol liners are made of two parts only.



Hackmann Idol Track Liner



Hackmann Duplex Track Liner

FOR USE WITH ANY ORDINARY LINING BAR

THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY LABOR SAVING DEVICES—723 So. Wells St., CHICAGO, ILL.

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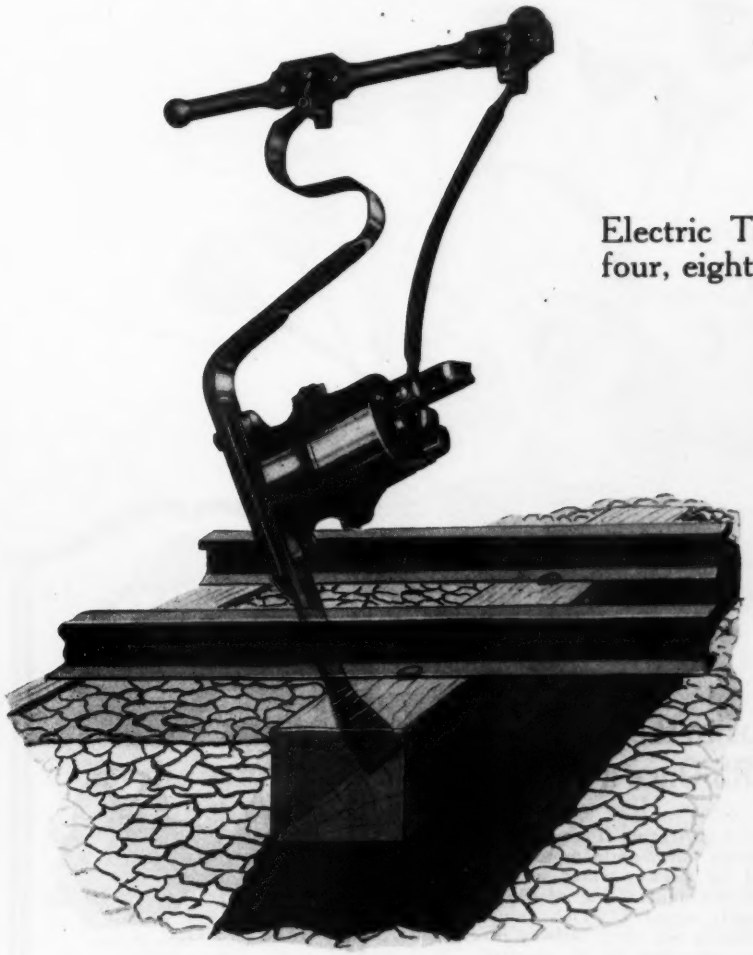
ELECTRIC TAMPING

A Most Successful Method of Tamping Rock, Gravel, Chats, Cinders or Other Ballast



Electric Tampers are made in four, eight or twelve tool units.

Send for our catalogue TT-6 and instruction book covering mechanical tie tamping methods.

AN IMPROVED TAMPING METHOD

By reason of the rapid blows delivered by the electric tamper (4000 per minute), a settling process of the ballast takes place which eliminates voids such as are left between the pieces of larger ballast when hammered in by a slower blow.

This results in a ballast of uniform density under the entire load bearing portion of the tie.

Consequently the roadbed is more permanent.

ELECTRIC TAMPER & EQUIPMENT CO.

RAILWAY EXCHANGE CHICAGO, ILLINOIS

WHY DO THIS DAILY?

Packed Piston Type Direct Connected to Motor

Enclosed Duplex Packed Piston Pump

Enclosed Duplex-Outside Center-Packed Plunger Type

Save Scores of Trips to the Pump House —Oil GARDNERS Once a Month!

The GARDNER Self-Lubricating Pump, oiled from one reservoir like an automobile motor,—is especially recommended for railway water service due to the distance from the right of way at which the pump house is usually situated. This pump, with motor drive, constitutes the ideal railway installation, as it can be controlled by an electric switch from any distance and visited only once each month. All styles and capacities. Ask for descriptive bulletin.

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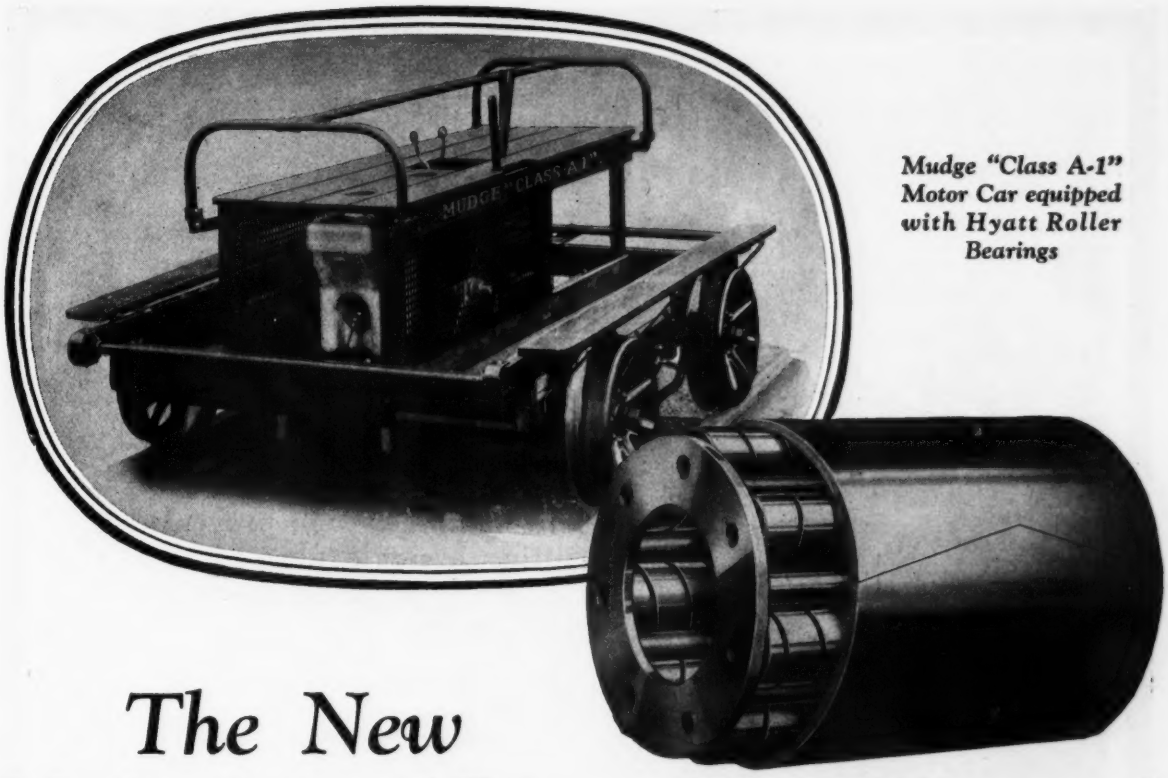
GARDNER



Mudge "Class A-1" Motor Car equipped with Hyatt Roller Bearings

The New Mudge A-1 and B-2 are HYATT Equipped

Based on a record of many years service on Mudge Motor Cars Hyatt Roller Bearings have been chosen for the new "Light Section" Class A-1 and the new "Light Inspection" Class B-2 motor cars.

Hyatt Roller Bearings, as well as the 4 H. P., free running, water cooled motor, were adopted to provide uninterrupted service at minimum expense under the most severe conditions.

The sturdy Mudge Motor, the rugged maple under frame, pressed steel wheels and Hyatt Roller Bearings combine to make a car that will give many years of satisfactory service.

Hyatt Roller Bearings need no repairs or replacements and are practically frictionless. They will improve motor car performance and eliminate many costly delays.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago San Francisco
Worcester Philadelphia Charlotte
Pittsburgh Cleveland

HYATT

ROLLER BEARINGS

PREVENT TIE CUTTING
THE Lundie Tie Plate, under the most severe conditions, over a long period of time, has proven itself to be an *economic* device of superior value.
Its *scientific design* prevents cutting a single fibre of the tie, while holding track to rigid gauge.
The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago
LUNDIE TIE PLATE

"Rajo" No. 4 for Heavy Terminal Track Work

Keep Two or Three of them on Every Division

KEEPING PACE WITH PROGRESS

Combines Speed and Power

"Rajo" No. 5

The Rail Joint Company 165 Broadway New York City

WHY we use Linde Oxygen

Linde oxygen, used by Oxweld Railroad Service, has been industry's standard for years. Thirty-seven plants, located at important railroad junction points, guarantee its availability at all times and in unlimited quantities.

The intelligent and practical use of such a high-quality product is the job of Oxweld Railroad Service. Its men are experts in welding and cutting by the oxy-acetylene process. For 14 years they have perfected the applications of welding and cutting to railroad work. They have developed technique especially adapted to the problems of the individual road. They are pioneers as well as experts.

THE OXWELD RAILROAD SERVICE COMPANY

New York City: Carbide and Carbon Building *Chicago:* Railway Exchange

Oxweld

Railroad Service

Make these savings in rail-laying

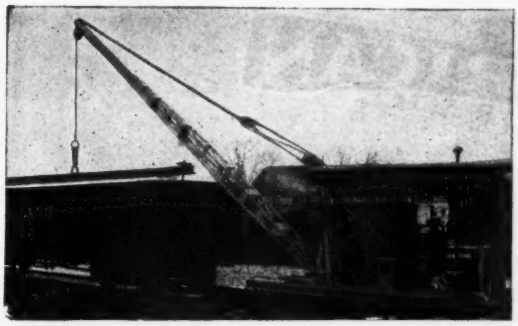
Transcontinental roads find Parsons Rail Cranes materially reduce the cost of laying rail

FROM their own cost records, maintenance of way officials on any of the roads that have been using Parsons Rail Cranes the past season can tell you this—

With the Parsons Rail Crane, you can show a decided saving over your present costs of laying rail.

Compared with hand-labor, its savings are tremendous; as in laying 140-pound rail the Rail Crane replaces from 18 to 22 men. And compared with any other rail-laying equipment, the Rail Crane has important advantages in Range, Safety and Economy.

Greater Range. The boom extension to 35 feet gives the Rail Crane greater working range and enables it to unload 39-foot rail from gondola cars. The 40 hp. Waukesha engine gives more than ample power for handling loads up to 3,000 pounds.



With the boom extension, the Parsons Rail Crane has the reach to unload rail from gondola cars.

The Parsons system of counter-weighting enables the Rail Crane to work through an angle of 90 degrees from the track on each side. Yet even with a load and with counter-weight in position, the Rail Crane need not be kept stationary, but can be moved to any desired distance.

Close-up view of power swing, showing worm and worm gear which control the angle of the boom.

Greater Safety. The boom-swing is operated by power, controlled by worm-and worm-gear. Thus the boom is automatically locked in position whenever at rest—a vital safety factor.

When clearing for trains, the Rail Crane may be moved off the track to a set-off station in less than five minutes. If a siding is to be made, the road speed is 20 miles or more per hour. From the stand-point of safety, these features are also especially important.

Greater Economy. The Parsons Rail Crane has year-round usefulness. When the rail-laying season is over, roads use it profitably around the yards. And the Parsons Rail Crane requires a smaller capital investment than any machine of near its capacity.

Thorough investigation will prove to you the definite advantages of the Parsons Rail Crane for your track-laying. Write for Bulletin 26-C, giving detailed specifications, and for a list of officials who are now using Rail Cranes.

THE PARSONS COMPANY, Newton, Iowa, U. S. A.

PARSONS RAIL CRANE

DOES THE WORK OF 10 TO 22 MEN

THE American" type DSMD centrifugal pump is a horizontal split shell, single stage, double suction, centrifugal pump furnished with bronze enclosed impeller, bronze labyrinth wearing rings, bronze shaft sleeves and bronze split glands.

Pump is mounted on extended cast iron base to receive motor and is provided with flexible coupling of the pin and bushing type for direct connection to motor.

Pump is of the double suction type and is built in sizes from 2" to 42" and for designed heads up to 250' depending upon size and capacity.

The bearings of the pump are entirely separate from the stuffing boxes which eliminates the possibility of any grit or water in the bearing. The oil reservoirs in the bearing are large, furnishing an ample supply of oil. The stuffing boxes are water sealed so as to insure tight packing without excessive pressure for friction on the revolving shaft.

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When the gang and the car's all there

That *train-like* regularity

You have a right to expect the same regularity of service from the section car that you buy today, that is given by a good automobile. Do you get it?

If not, you should consider the fact that Fairbanks-Morse has played the leading part in lifting the section car above the plane of the old-time car and putting it on the plane of the modern automobile.

Fairbanks-Morse engineers have kept the Sheffield line of motor cars strictly abreast of the most advanced automotive practice. They have put into these cars countless unduplicated features.

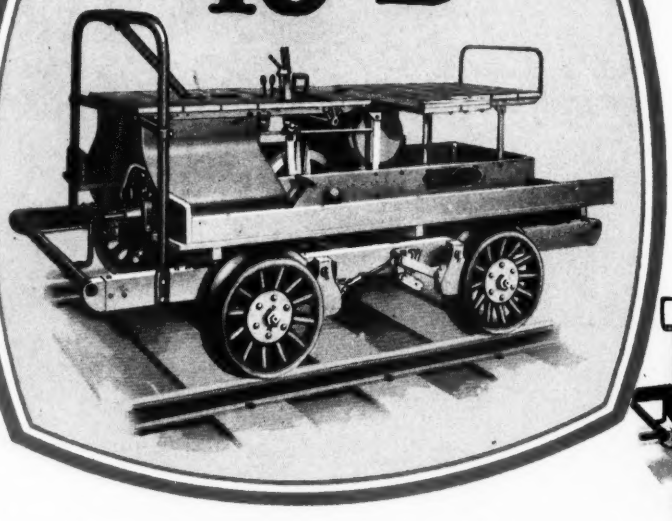
But out of all these features has come one dominant virtue — the ability to stay everlastingly on the job—to get there with train-like regularity.

Sheffields are the kind of cars that appeal to every type of operator except the type that likes to tinker!

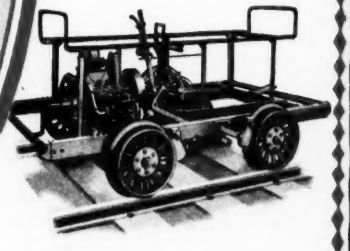
FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

"40-B"



The Sheffield "40-B" with body removed to show trim, rugged construction and advanced design



There *is* no finer car—

WHEN a fine car is demanded for meeting all requirements, consideration must inevitably narrow down to the "40-B." The superlative service and downright dependability of this quality car have never been surpassed.

That it follows the best automotive construction is evidenced by features like three-point suspension of the engine, auto-type pressed steel frame, etc. The friction transmission has been greatly simplified. Large Timken roller bearings carry the drop-forged, heat-treated crankshaft, absorbing both radial and thrust loads. Engine is the improved powerful four-cycle, valve-in-head design.

The "40-B" is simply the standard bearer for a wide range of F-M section cars that have been making history for more than thirty years.

Ask for complete description of any of the cars listed opposite

Sheffield 44
First in the one-cylinder water-cooled class with the positive chain drive, and the clutch that won't burn out.

Sheffield 45
The same general construction as the famous "40-B," but slightly lower powered. Has 22 square feet of unobstructed deck space—the most space ever provided on a section car.

Sheffield 41
The leading center load car for roadmasters and linemen, signal service and engineering work.

Sheffield 32
Proved by 15 years of success to have the lowest maintenance cost of any section car ever built.

FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of railway motor cars, hand cars, push cars, velocipedes, standpipes for water and oil, tank fixtures, oil engines, pumps, motors, scales and complete coaling stations.

FAIRBANKS-MORSE
MOTOR CARS

First on the rails —*and still first*

A998—ARA21.5

RACOR

SEVEN WORKS
RAMAPO-AJAX-ELLIOT
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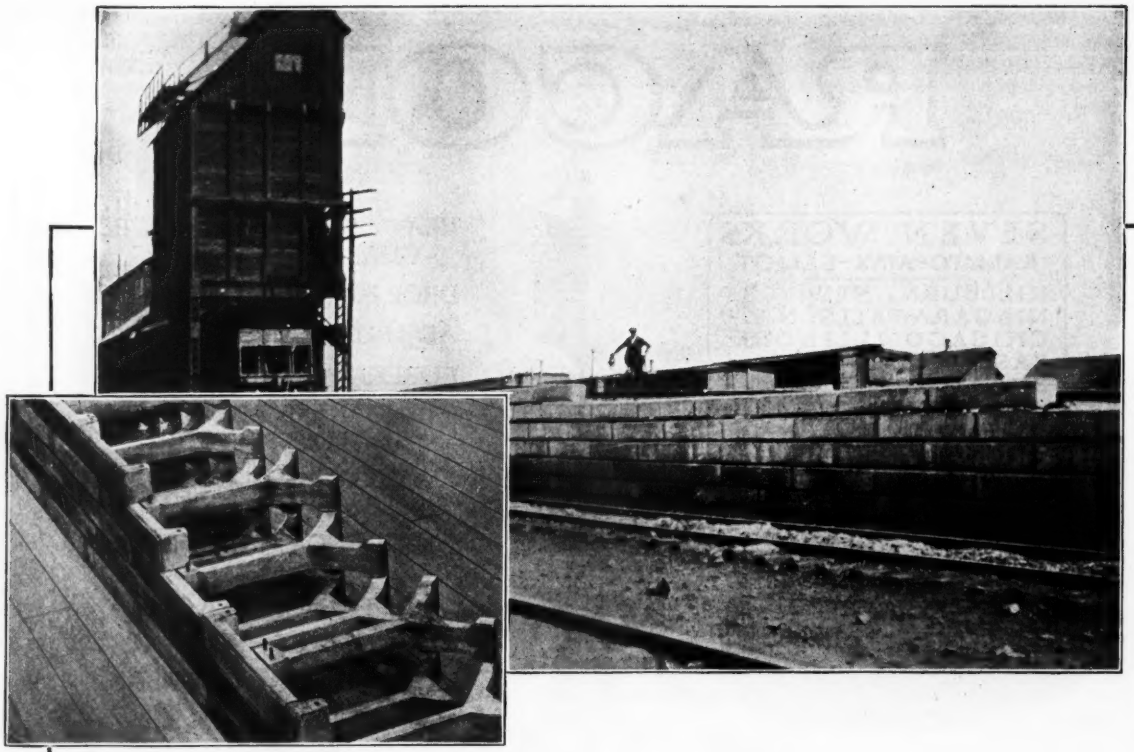


A Federal Concrete Crib Wall consists of two substantial units, thus eliminating the usual third member in the back fill. The Y-shaped header ends form a rear wall of cellular construction securely locked in the back fill. The stretcher or face members interlock with the headers forming a retaining structure of great strength, economy and attractive appearance.

This Cribbing Easily and Quickly Installed

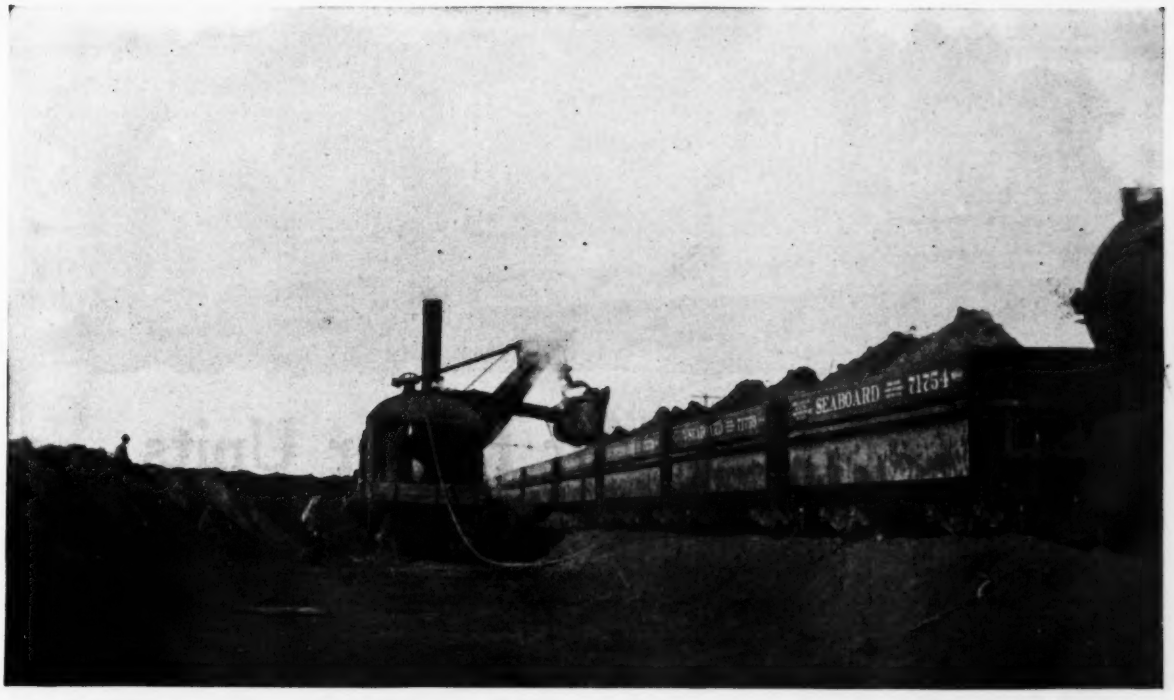
FEDERAL Concrete Cribbing Units have proved that they are easier to install than any other type of retaining wall. Permanent, but can be easily relocated with practically 100 per cent salvage; economical in first cost, improve with age and require no maintenance. A one-inch continuous slot assures free drainage with no possibility of backfilled material filtering through. Illustrated above is an installation at Chicago for the Grand Trunk.

For further information write to

FEDERAL CEMENT TILE COMPANY

608 South Dearborn Street, Chicago, Illinois

FEDERAL CONCRETE CRIBBING



MAINTENANCE OF WAY COST CUTTERS

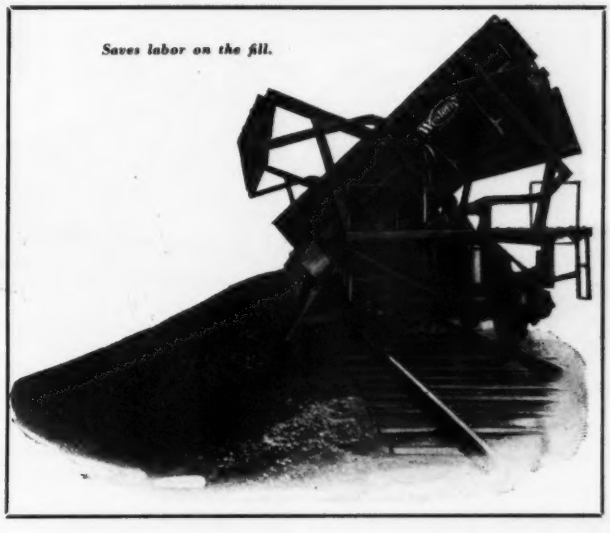
Life of the Maintenance of Way engineer is full of grief at best. Western Automatic Air Dump Cars will lessen your trouble and reduce your costs.

They are designed and built to help solve the problems of railroad maintenance of way, and are solving them satisfactorily on many railroads.

May we refer you to enthusiastic railroad men who are using them in ditching, bank widening, handling locomotive cinders and other railroad work.

Write today.

A 28-inch steel apron acts automatically to extend the floor of the car in dumping thereby throwing the material beyond the ties. This apron does not interfere with righting the car. The car can be righted instantly without shoveling or moving up the train.



Dump either way instantly without previous preparation. The ease and speed of dumping; the ability to run at high speed on main track; the few castings, easily replaceable, make Western cars popular with railroad men. You can depend upon them.

Western Wheeled Scraper Company

Founded 1877

Earth and Stone Handling Equipment

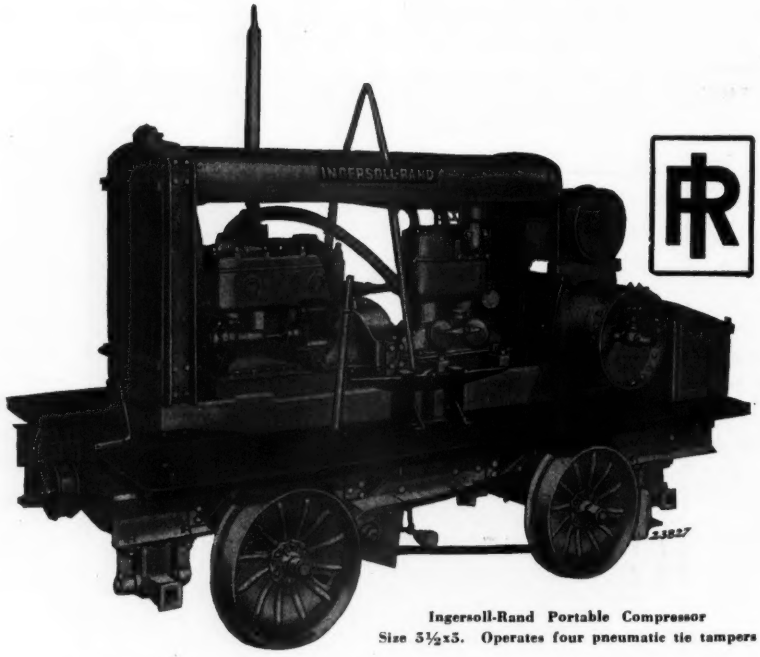
AURORA, ILLINOIS

I-R Portable Air Power Units

Ingersoll-Rand Compressors for railway service are not only available for the operating of Tie Tampers, but can be successfully and economically used for operating Pneumatic Tools, Sand Blasts, Paint Sprays, etc., in bridge repair work and for emergency use anywhere Compressed Air Power is required—such as operating signal lines, rock drills in tunnel and culvert work, pumping water, etc.

These units embody all of the highly refined and superior points of construction contained in the widely known Ingersoll-Rand Type 20 Portable Compressors which are so extensively used by contractors, public utilities, communities, etc. They are without doubt the most highly developed Power Air Compressors for railway work built today. Service records of hundreds of these Compressed Air Power Units in the railway field characterize them as the most rugged, compact and efficient plants available.

An Ingersoll-Rand Portable Railroad Compressor is a complete power plant. Nothing is lacking. It is ready to go to work as soon as the fuel, water and oil are supplied. There are three sizes available with capacities to operate 4, 8 or 12 pneumatic tampers.



Ingersoll-Rand Portable Compressor
Size 5½x5. Operates four pneumatic tie tampers

INGERSOLL-RAND COMPANY, 11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 260 St. James Street, Montreal, Quebec

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BUDA
ESTABLISHED 1881

A CELEBRATED BUDA MOTOR CAR

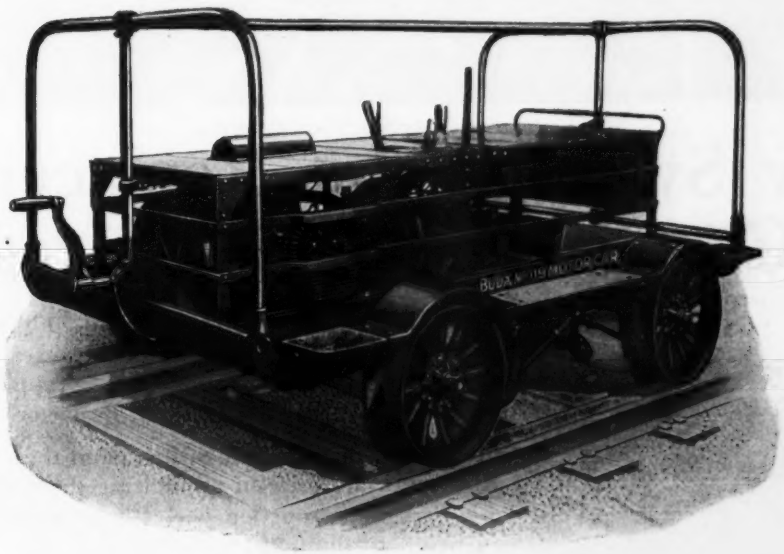
Another of the DEPENDABLE NINETEEN SERIES That Has Made Its Reputation, Engine 12-14 Horse Power—4 Cycle

No. 119 MOTOR CAR—Air Cooled

DISTINCTIVE FEATURES

Ample power for grades, trailing loads and head winds—weight over front axle—easily handled—all parts of the power plant accessible

Friction Disc Transmission with Roller Bearings



4 Wheel Brakes with Adjustable Toggles

STARTS UNDER ITS OWN POWER—FULL HORSEPOWER AT ALL SPEEDS—WILL PULL HEAVY TRAILING LOADS

The anti-friction bearings provided at all points of friction transmit the greatest percentage of Horse Power to the driving wheel

Write for descriptive catalogue

THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

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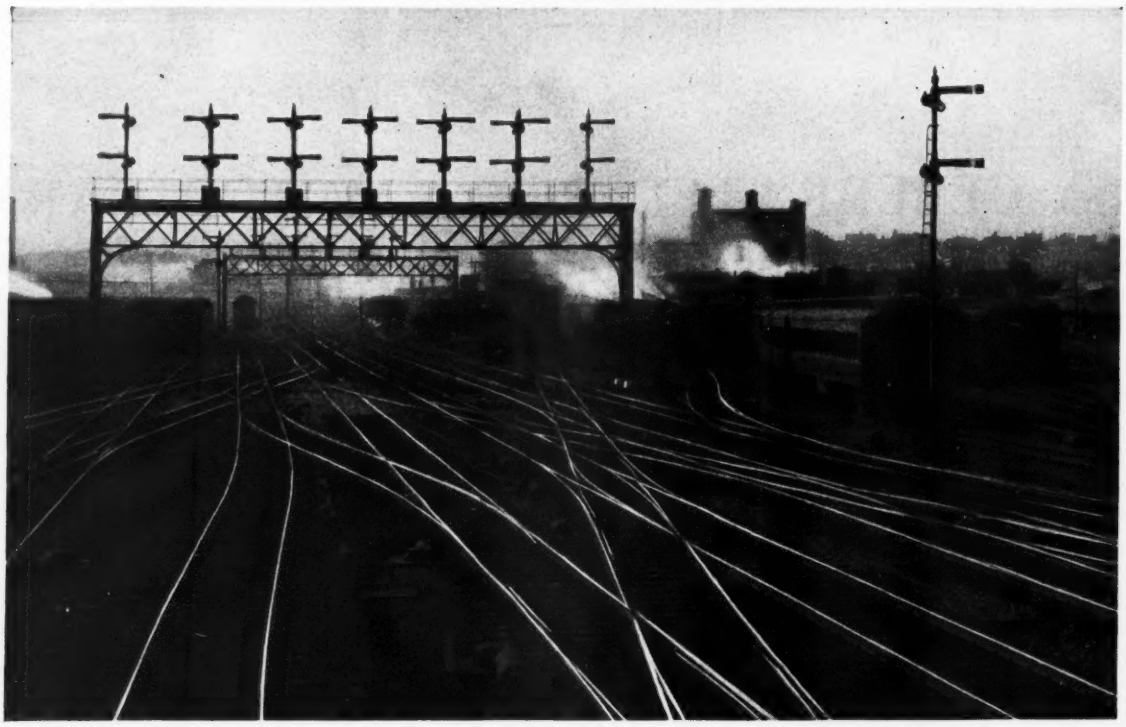
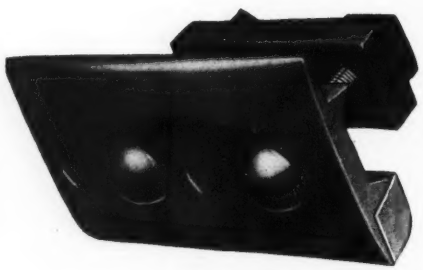


How Switch Point Replacement Cost is Being Minimized



WHEREVER a Switch point is used its service life can be extended 5 or 10 times longer by protection against excessive wear through the application of the "Mack" Reversible Switch Point Protector.

Set directly ahead of the Switch point these protectors act as a shock absorber in minimizing the impact of passing wheels. They function perfectly regardless of operating or weather conditions.

The reversible feature permits double wear and a double saving in the use of the protector.

"MACK" REVERSIBLE SWITCH POINT PROTECTOR

Ask us to send you a few for a test.

is made of manganese steel to fit any size rail. Besides switch point protection they are a valuable aid in reducing the possibilities of derailment.

Manufactured by **J. R. FLEMING & SONS CO., Inc., Scranton, Pa.**

Patented in the United States and Foreign Countries

Exclusive Agents for the United States

The Maintenance Equipment Co.

NEW YORK CHICAGO ST. LOUIS

Save 40 to 70%

on your painting appropriation

This modern, proven way—

IT HAS been proved hundreds of times that from 40 to 70% saving is accomplished by using Matthews Mechanical Painting Equipment in the painting of interiors and exteriors of factories, garages, warehouses, apartments and other buildings. There is no more uncertainty or guess about the big savings possible. Industry everywhere is using mechanical painting methods.

Compare These Costs

These figures show the daily average of one man painting on various surfaces.

	Mechanical Painting	Brush Method
BRICK	8,000 sq. ft.	1,300 sq. ft.
CORRUGATED IRON	6,000 sq. ft.	500 sq. ft.
ROUGH STUCCO	5,000 sq. ft.	450 sq. ft.

The saving on painting interiors is even greater, as one coat of paint put on by mechanical painting equipment often is enough whereas two or three coats are necessary by the brush method. The brush mixes with the wall dust and dirt giving a streaked appearance. At least one other coat is needed. The machine applies a coat without this admixture and it is also possible to apply heavier coats with the machine without danger of paint running. This is an immediate saving of 50% on materials alone, to say nothing of less disturbance from painters slowing up your plant production while at work.

Users Agree

No other method offers such ease, speed, freedom from disturbance, economy and excellence of finished work. No other equipment will stand rough treatment like Matthews. Everywhere maintenance painting by mechanical equipment has become the accepted practice in thousands of plants. Get the facts.

For 8 Reasons

For 8 outstanding reasons Matthews is overwhelmingly preferred to any other painting equipment. Learn why.

1. It is the fastest, most rugged, high grade painting tool yet developed.

2. Complete control is in the operator's hands. A wide range of adjustments is available.

3. Mist and fog are reduced to a minimum—no uncontrolled spray, splatter or leakage.

4. It is easy to operate and understand. Average maintenance department man can quickly become proficient.

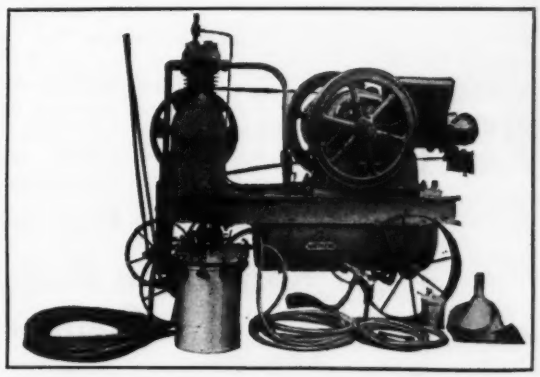
5. It is simply constructed with a minimum of parts. Rugged in construction—built for heavy duty. All wearing parts are interchangeable.

6. Parts and service available in all parts of the country.

7. It is backed by a strong service organization. With each complete power driven equipment our service man will spend sufficient time with you to thoroughly acquaint your men with its use and operation.

8. Matthews Mechanical Painting Equipment has been designed, improved and perfected and is guaranteed by a company with a reputation of 28 years of business integrity. It is built to withstand the daily grind of field service.

The W. N. Matthews Corporation manufactures a complete line of mechanical painting equipment. There is a Matthews Equipment for every painting need. If you finish products in your factory with any kind of surface coating, ask for booklet, "Mechanical Equipment for Product Finishing."



Get This Booklet

"Mechanical Painting for Industrial Maintenance" contains many interesting facts and useful data. Send for it and learn how to reduce your painting costs.

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MECHANICAL PAINTING
EQUIPMENT

W. N. MATTHEWS CORPORATION, ST. LOUIS, MO.

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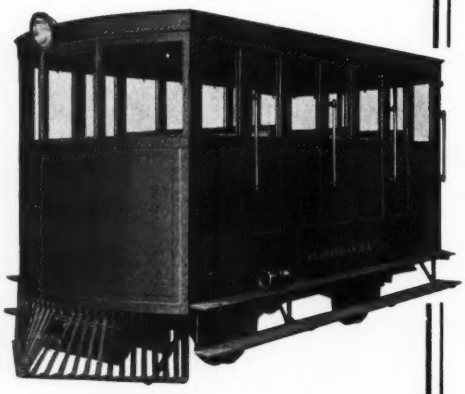
KALAMAZOO "35"

The Multiple Purpose Motor Car

All jobs look alike to the Kalamazoo "35". The same chassis is used on any one of 10 different types of bodies, and on all of them it proves its ability to handle **any** job.

Every day of the year Kalamazoo "35's" are out on the road doing service as Hump Cars, Work Cars, Passenger Cars, Inspection Cars, or Combination Passenger and Express Cars. They will stand up equally well under the low-speed, heavy-duty work required of the Work Car or the high-speed operation of the Inspection or Passenger Car.

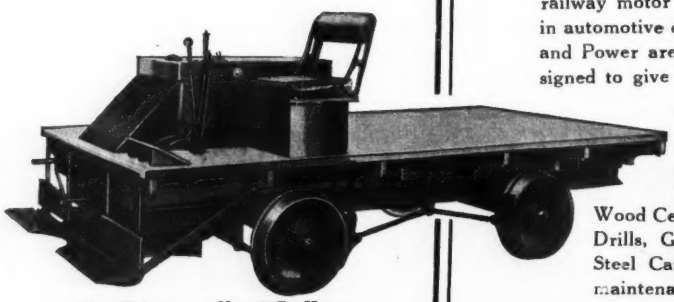
The Kalamazoo "35" is distinctly a product of the latest improvements in automotive engineering. It is a car which combines simplicity of design with rugged construction. The use of Kalamazoo "35's" cannot help but effect a material reduction in the up-keep cost of maintenance of way equipment.



The Kalamazoo No. 35G Enclosed Inspection Car seating 12 persons; an ideal all-weather car.

The Kalamazoo Line What It Means to You

The name **Kalamazoo** on any car is a guarantee of quality. Our factory has developed the most modern line of railway motor cars, embodying the latest improvements in automotive engineering. The ideas of Safety, Comfort and Power are followed in all models. Each car is designed to give maximum service at a minimum upkeep.



The Kalamazoo No. 35B Heavy Duty Work Car—for construction work, distribution of materials, etc.

We manufacture also a complete line of Hand cars, Push Cars, Rail Cars, Velocipede Cars and Trailers, Electric Crossing Gates, Rolled and Pressed Steel Wheels, Wood Center Wheels with Steel Tires, Moore Track Drills, Gauges and Levels, Wood Cattle Guards, Steel Cattle Guards—in fact a complete line of maintenance of way equipment.

Kalamazoo Means Service to You

Kalamazoo Railway Supply Company

Kalamazoo **Michigan**

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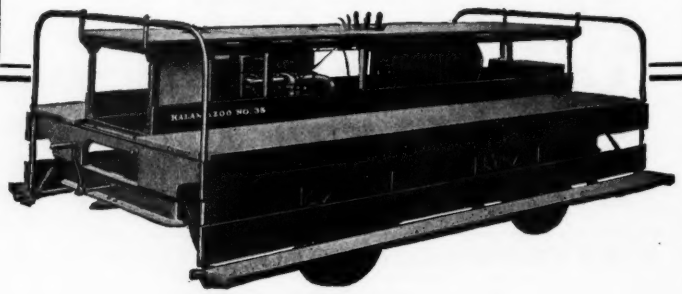

The Kalamazoo No. 35 Motor Car — Standard Body seating thirty men.

A Mouthful at Every Bite

Guarantee
Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—
—or—
Write your own guarantee!
THE OWEN BUCKET CO.
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INSURE A BIGGER DAY'S WORK
Owen Buckets

FOR digging and excavating . . . stiff clay. . . compact loam . . . shale . . . lime-stone . . . there's an Owen.

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For handling and rehandling . . . slag . . . coal . . . coke . . . crushed stone . . . clinkers . . . there's an Owen.

And every Owen—like the savage gorilla—is famous for getting a Mouthful at Every Bite.

A post card will bring you our recommendations for solving your bucket problems.

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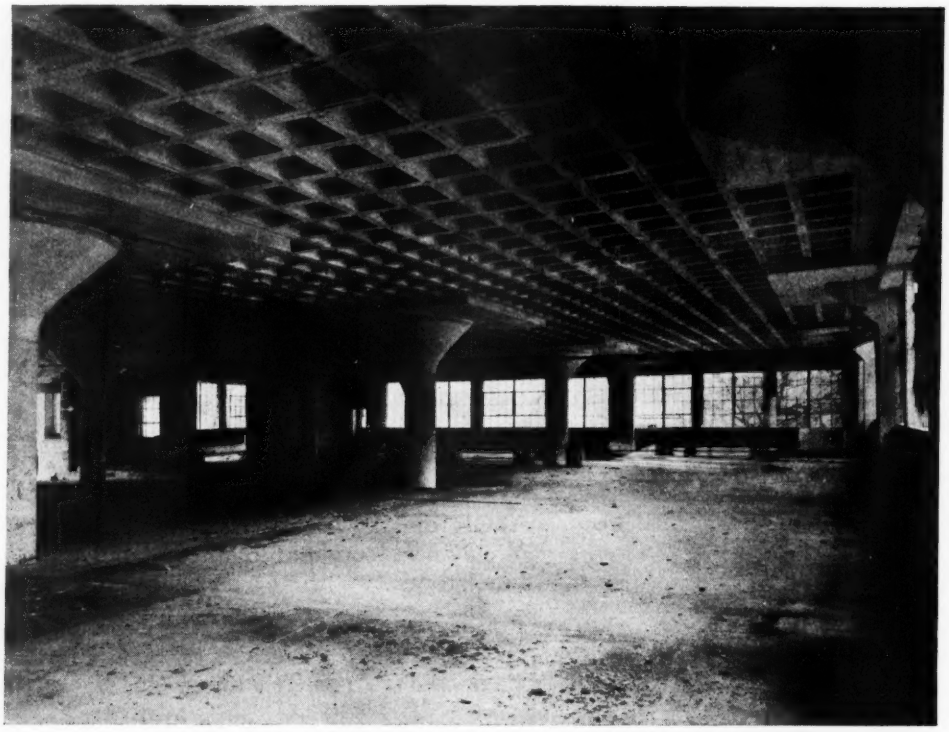
CAL *the greatest protection against faulty concrete construction - - -*



CAL is as easy to use as Portland Cement. It is a powder which may be accurately measured by volume. It requires no preparation on the job. Its white color prevents danger of double treatment or omission.

HOT dry weather dries concrete rapidly from the surface resulting in a soft-cured, porous condition that develops a cracked surface offering easy entrance to rain, frost and other destructive atmospheric agents.

CAL is your greatest protection against such faulty concrete construction. According to tests made by the U. S. Bureau of Standards, where CAL is used under the conditions as cited above the strength of the CAL treated mortar at 2 days is considerably above that of the untreated mortar at 28 days.

Make CAL a part of your cement shipment.

For QUICK HARDENING CONCRETE
For WATERPROOFING FROSTPROOFING AND TATTENING CONCRETE MORTAR —STUCCO
USE CAL
Ready for Work
WITH YOUR FAVORITE BRAND OF PORTLAND CEMENT

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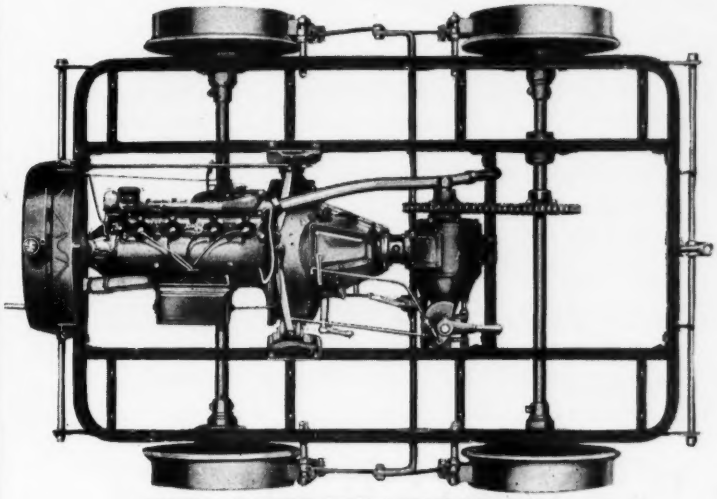
HEAVY DUTY RAILWAY MOTOR CAR

With Standard Ford Motor—20 H. P.—and Casey Jones Automotive Gear Transmission—Equal Power Either Director



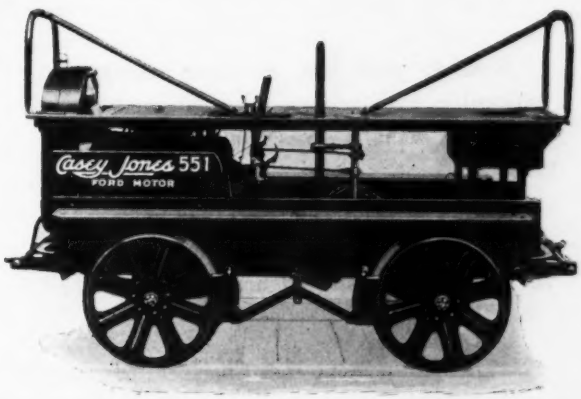
SHOWING ALL STEEL CHASSIS AND TRANSMISSION

LOADS OF POWER—
—POWER FOR LOADS

For extra gangs, for bridge crews, hump and signal service.

For operating weed mowers, discing machines and moving material. Standard Ford motor service everywhere — Special Casey Jones gear transmission—Fool proof and 100 per cent efficient. Equal power and speed in either direction. Capable of moving 125 men with trailers.

Get the facts concerning this remarkable motor car. Designed for heavy duty service, it shatters all performance records. Detailed information on request.



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KOPPEL INDUST. CAR & EQUIP. CO.
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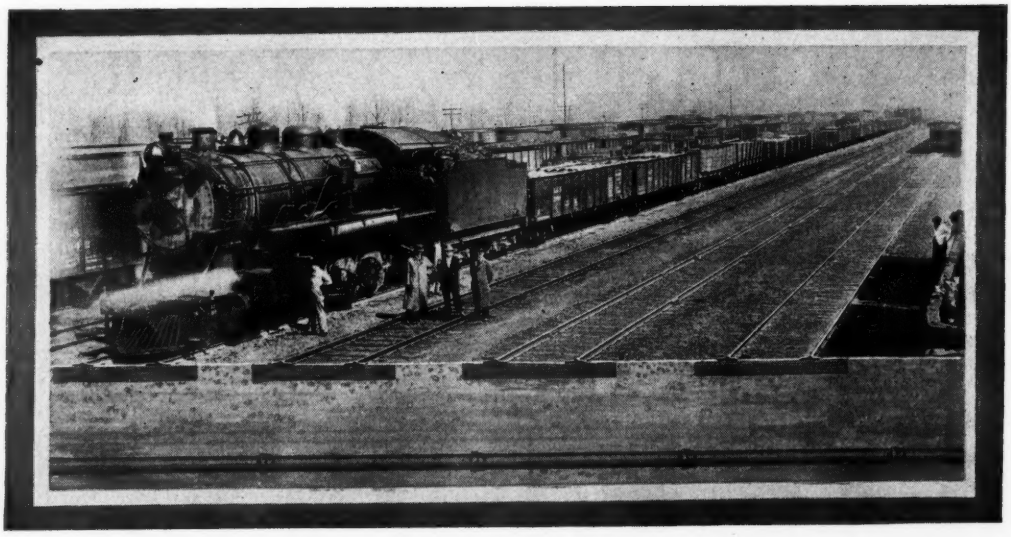
THE RIGHT CAR FOR EVERY CLASS OF SERVICE		
CLASS A	FOR HEAVY DUTY	CASEY JONES 551
CLASS B	FOR STANDARD SECTION	CASEY JONES 521
CLASS C	FOR LIGHT INSPECTION	CASEY JONES 531
FOR BETTER RAILWAY SERVICE—SPECIFY CASEY JONES		

NORTHWESTERN MOTOR CO.

FACTORY AND GENERAL OFFICES
EAU CLAIRE, WISCONSIN

ACIPCO MONO-CAST CENTRIFUGAL PIPE
BELL AND SPIGOT



Should A Pipe Yield Or Resist?

Both to yield and to resist seems an impossible combination. Yet a good cast iron pipe actually does both at the same time.

Ability to bend is a far better quality in a cast iron pipe than ability to resist bending, for in handling and in actual service, the bending force on a pipe often is practically irresistible for short distances and—

The only hope for the pipe *is to yield.*

If it does not, it breaks.

Ability of Mono-cast pipe to bend under stress is approximately 33% more than any other kind of centrifugal pipe.

Mono-cast Specifications mailed on request. Write for a copy.

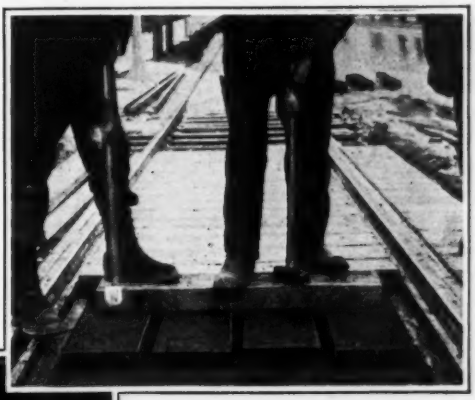
AMERICAN CAST IRON PIPE COMPANY
BIRMINGHAM, ALA.
DISTRICT OFFICES IN PRINCIPAL CITIES

ACIPCO MONO-CAST CENTRIFUGAL PIPE
BELL AND SPIGOT

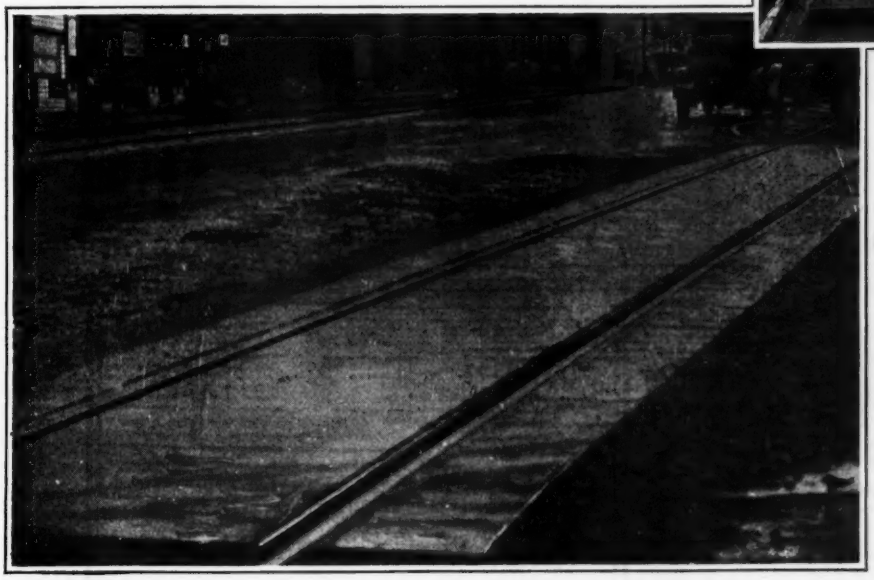
MONO-CAST MEANS MADE AS A UNIT—AN INTEGRAL CASTING, EVERY PART OF WHICH IS FORMED AT THE SAME MOMENT BY CENTRIFUGAL FORCE

(105) *"Mono-cast" is the trade mark of the American Cast Iron Pipe Company.*

If water seeps in, *the crossing is doomed!*



The preformed slabs arrive on the job cut to fit—and are easily installed with ordinary tools.



Carey Elastite Preformed Track Pavement excludes water and frost from this crossing.

EVERY maintenance engineer knows that as soon as water seeps into the rail joints or under the rail in a grade crossing, the crossing pavement is doomed.

And that's one of the reasons why careful engineers are turning more and more to Carey Elastite Preformed Track Pavement—for this improved method excludes water, and frost, too. The fibrous asphaltic material works with it, keeping the crossing watertight at all times.

Carey Elastite Preformed Track Pavement consists of rail filler and pavement slabs about 2" thick—both made from a fibrous asphaltic material that knits and heals under traffic. The hammering of heavy trucks will not shatter it. In fact, experience has shown that hard wear actually tends to keep it in condition.

The preformed slabs arrive on the job cut to fit, and can be installed easily under all weather conditions—with ordinary tools. Write, today, for complete facts about this new, improved grade crossing pavement.

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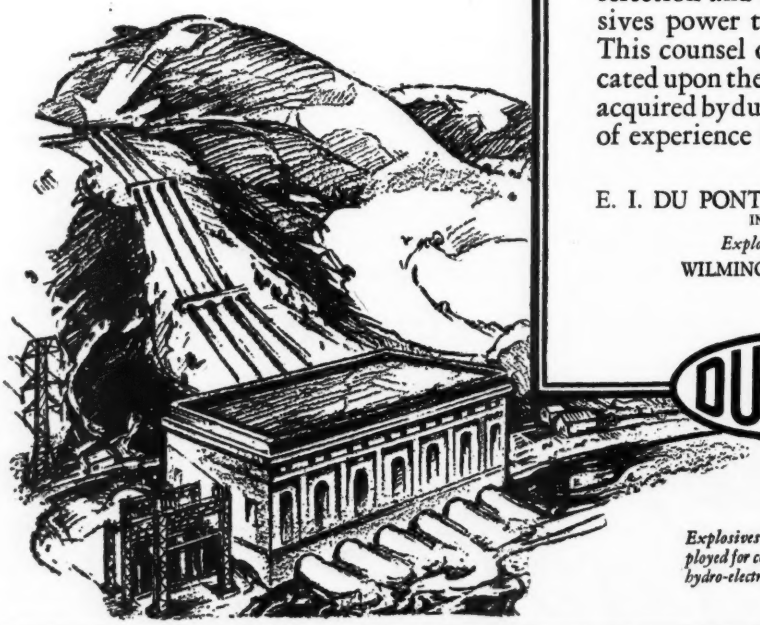

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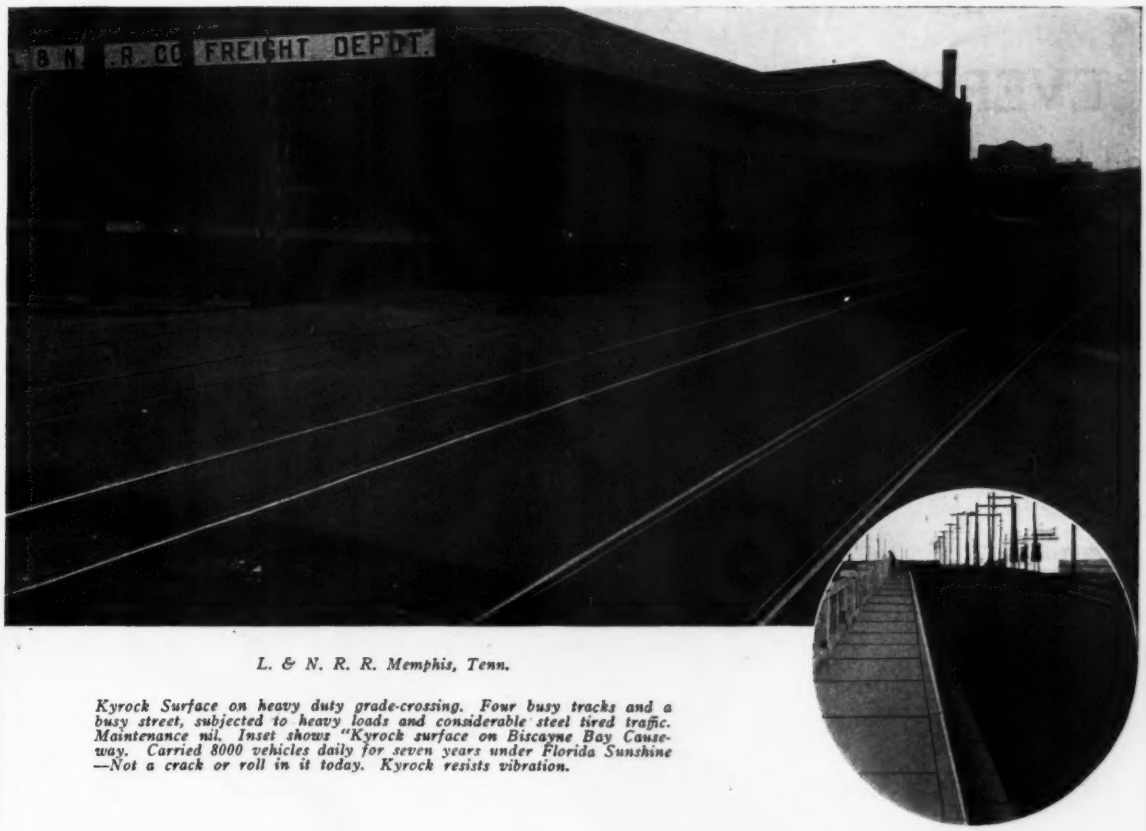

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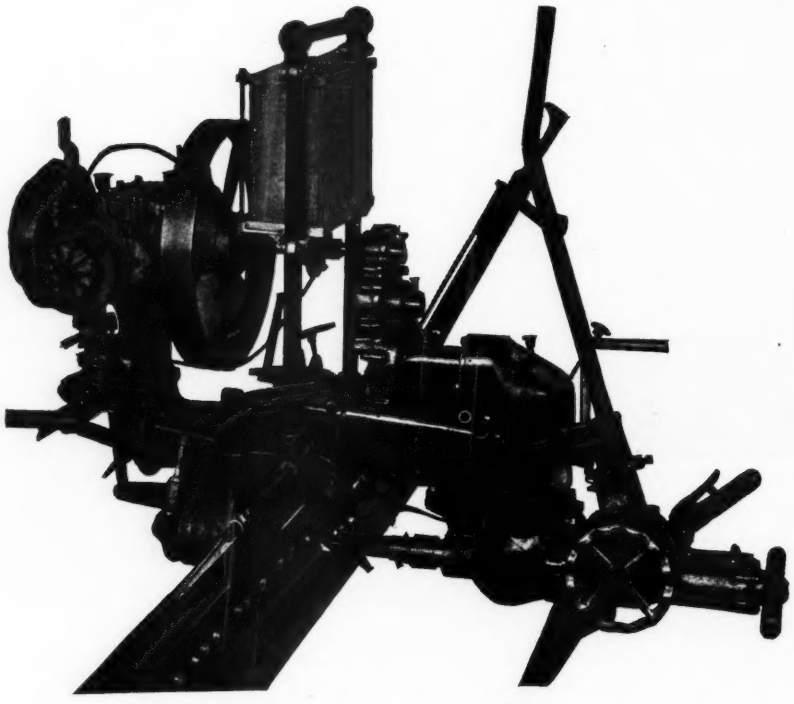

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The **Everett Power M-W Track Drill** is similar in general design to the Everett Power Bonding Drill which, during the past four years, has made such **remarkable records for economy** in labor and drill consumption that practically every large railroad is now equipped with them.

One man with the **Everett Power M-W Track Drill** can drill a bolt hole in less than **one minute** which previously took **two men about thirty minutes** with a hand operated drill. The **Everett** will **pay for itself in a very short time.**

The **reduction of time required** to complete the work will, in many cases, be an even more important factor.

The **Everett Power M-W Track Drill** is designed to drill up to 1½ inch holes through the web of rails **any size** from 65 to 150 pounds. It is also designed to drill web of rail through **splice bars.** It will drill rail when in track or **out** of track. It will drill holes to within 2¼ inches **from end** of rail with **no other** rail adjoining.

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Railway
Engineering and Maintenance

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THE SUPPLY TRAIN

ON ANOTHER page of this issue we present a discussion of supply train service which centers largely around the relative merits of a 30-day or a 60-day interval between trips of such a train. This discussion is an abstract of the report of a committee of Division VI, Purchase and Stores, of the A. R. A., and is naturally presented from the point of view of the stores officer. It is significant that no word is given in opposition to the idea of operating supply trains. Apparently, insofar as stores officers are concerned, there is rather general agreement as to the advantage of handling the delivery of supplies and the picking up of discarded or defective equipment and materials by means of a stores department train operated at regular intervals.

A supply train also has its advantages from the standpoint of the maintenance of way officers. It insures regular delivery, effects a better understanding between storekeeper and user, solves the problem of the immediate replacement of defective tools by tools in good repair, and affords a regular opportunity for a thorough inspection of the tools and equipment in the hands of each foreman. Whether the train is to be operated on a 30-day or a 60-day schedule is of course a matter that may vary with local conditions. However, the operation of a supply train at regular intervals has much to commend it.

DON'T FORGET THE TRAILER

ONE OF THE outstanding developments in the construction of maintenance of way equipment during the past year has been the improvement of the track motor car and particularly the heavy duty car. This has been due in part to unusually active competition among the manufacturers, and also in part to the growing appreciation on the part of railway maintenance officers of the possibilties of the motor car as a substitute for the work train. As a result the newer designs of heavy duty cars are finding wide application for the transportation of men and materials over comparatively long distances. In such service trailers are a necessary auxiliary.

In the more recent designs of heavy duty cars much attention has been given to the adoption of those measures which promote safety in operation. Scarcely less attention has been given to the bearings and other details tending towards economy in operation. In general, however, the trailer has been neglected with the result that it differs little from the old push car of the hand-car days. In view of its increasingly important use as an adjunct to the motor car for the transportation of men, it warrants the same care in design and construction as the motor car itself to reduce the danger of derailment and the possibilities of injury if derailment occurs. Likewise, if the use of roller bearings and other measures to promote economy of operation are warranted with the motor car itself, they are equally justified on a trailer to reduce the power required to draw it. In view of the particularly severe service to which a trailer may be subjected in the handling of ties and other track materials, it is also important that it be of sturdy construction to withstand the blows that it may receive. In brief, while simpler in design, the trailer warrants the same careful attention as the motor car if it is to render the best service.

THE MAINTENANCE MAN'S PART

ONE OF THE outstanding indexes of the efficiency with which the American railways are being operated is the constant increase in the number of tons of revenue traffic handled per train. As an illustration, the revenue train load of all Class 1 railroads in the United States increased from 396 tons in 1911 to 647 tons in 1924, or 63 per cent in 13 years. This was made possible in large part by an increase of 44 per cent in the average tractive power of locomotives during the same period. However, this does not tell the entire story, for the above figures are averages for light and heavy traffic lines in all parts of the country and the development in train loading has been far more pronounced on the main trunk lines of dense train movement. Here the introduction of heavy locomotives has received its greatest impetus, for every increase in the train load reduces the number of trains run. As a result, trains of 2,500 and 3,000 gross tons have given way to those of 6,000, 7,500 and even 9,000 tons in regular service on many divisions. It is under such trains and the locomotives required to handle them that the tracks and structures receive their most severe service.

It is the function of the maintenance of way department to meet and in fact to anticipate the demands of the operating department by increasing the strength of its track structure for increases in train loading can only be made up to the limit of the loads that the track and bridges are able to carry safely. The track and bridges are essential units in a transportation machine and the forces engaged in their maintenance are essential units of a transportation organization. These men should have as their objective the provision of that roadway that will permit traffic to be moved most economically. The

record that has been made reflects to the credit of the maintenance of way department just as directly as to that of the transportation, the mechanical or any other department. At no period in the history of the American railways has greater progress been made in the reduction of transportation costs than in recent years. In spite of this fact, there is no reason to believe that the end of this development has yet been reached.

CONSIDER THE COST ALSO

NOTHING develops esprit de corps more effectively than the meeting of an emergency. There is something about the work of restoring traffic after a bad train accident or a washout that brings out the fighting spirit of men. They become oblivious to hardships or the weariness of long hours. In fact, they are eager to "stand the gaff" until the job is done. Railroad men have long had instilled in them the fundamental principle that an interruption to traffic is the most serious thing that can happen to a railroad. It is up to them to close the breach in the line. They have been given to understand that the scope of authority may be stretched at such times far beyond anything that would be countenanced under normal conditions. Consequently, men feel a freedom in incurring expenses which they would not dare to exercise in the course of routine work, for they know that the cost is of secondary consideration at such a time and that the record of an emergency job well done will be remembered long after the cost is forgotten.

Because of the attitude of mind thus engendered, there is a danger that opportunities for thoroughly practical economies in connection with emergency work will be overlooked, that work may be done in the rush which, if not handled with some thought to future necessity, may have to be done over again when permanent restoration is undertaken. What is meant by this may be illustrated by the manner in which the Rock Island bridge gangs placed falsework under a Mississippi river bridge after a fire which burned off the deck and seriously injured some of the steel work of the spans, as described elsewhere in this issue. The pile bents driven to support these spans so that they could carry traffic were so placed that very little added expense will be incurred for such additional falsework as must be provided when the injured members are replaced by new ones. On the other hand, it is easy to imagine that this work might have been done without regard to any consideration other than that of getting the trains running over the bridge at the earliest possible moment.

IT PAYS TO ADVERTISE

MOST railroads have come to the conclusion that it is good business to keep the station grounds in a presentable condition and they spend considerable money at stations along important lines for the planting of trees and shrubbery, for the mowing of lawns, and to secure a generally neat appearance. Even where landscape architects or gardeners are employed, a considerable part of this work falls on the section forces, particularly the mowing of lawns and the policing that is necessary to clean up rubbish that is scattered by a careless public.

When work of this kind is the result of the slovenly habits of passengers the railroad must bear with it in silence because these are the railroad's patrons and must be treated as guests. When, on the other hand, objectionable conditions are brought about by persons who are not patrons of the road, there is just cause for complaint.

As a case in point, across the street from a suburban station on a middle western road there is an ice cream parlor that has developed an unusually heavy business in the sale of ice cream cones to auto tourists who park their cars adjacent to the well-kept grounds of the passenger station and not only appropriate the lawn for use as a picnic ground, but avail themselves of the station toilet room and scatter lunch box refuse, ice cream cone trays, etc., on the lawn and platform. The appearance of the station grounds on a Monday morning after a busy Sunday can well be imagined.

If the railroad meets this condition in silence by devoting the time of one man for a half day or more to cleaning up this mess, the residents and officers of this village will undoubtedly give no thought whatever to this abuse or will be entirely satisfied to let the railroad solve the problem in its own way, as another service which the carrier can furnish to the village free of charge. If, on the other hand, the roadmaster makes a call on the village president or appears before the village board, he may not succeed in having any constructive action taken by the village authorities to correct the situation, but he can at least go on record as to the pains which the railroad is taking to keep its grounds in presentable condition and how much it is costing to do this. It is an unfortunate fact that something which is obtained for nothing is frequently taken as a matter of course and will not be appreciated until some definite pains are taken to show what it costs.

A HUMAN PROBLEM

NO PROJECT for improving the efficiency of maintenance of way work is now receiving greater attention than that of more permanent employment, since there is common agreement that security of employment is one of the most potent factors in retaining men of good character on the force, and in securing an effective esprit de corps. There is, however, another important point which must be taken into account if the railroads are to obtain full advantage of any decrease in the seasonal character of employment. As a rule, maintenance of way employees of the same grade are paid a flat rate. This is not so serious with bridge and building men or other skilled trades where schedules provide for laborers, helpers, carpenters, etc., but in the track department it means that practically all men are paid the same rate regardless of their skill or length of service.

It would be difficult to devise any plan which would provide a differential in rates that would take into account variations in both skill and length of service. One does not necessarily go with the other. A man does not necessarily become more efficient with increasing length of service. As an illustration of this complication, a certain road may be cited which follows the plan of paying new men five cents per hour less than the standard rate for the first few months of service, on the theory, no doubt, that the new employee is not as useful as one who has been in the service longer. But this plan sometimes leads to dissatisfaction on the part of the new man who has had previous track experience and deems himself

more efficient, and therefore worth more or at least as much to the railroad as some man who has been on the payroll longer than he has, but who is not as skillful or as energetic.

This illustration is primarily of value in pointing out how difficult it is to devise a scheme which will be satisfactory under all circumstances. It is well to bear in mind in considering this example, that in most cases the grievance will be on the other side, namely, that it is the faithful employee of long service who has good reason to be dissatisfied because the company is continually hiring new men of no experience at the same rate that it is paying him.

Whether the plan suggested above will be found the most practical solution in the long run for this intensely human problem, can only be determined after a thorough test. Other plans should also be tried, for surely the railroads should make every effort to develop a plan of compensation which will be instrumental in retaining high grade men in the service.

THE MENACE OF TRANSVERSE FISSURES

NO DEFECT in track conditions constitutes a greater menace to safety of travel than the transverse fissure in rails, not only because of its frequency but also and primarily because of the difficulty in detecting it before failure occurs. Up to the present time authorities have not been able to agree regarding the cause of this defect and as a result relatively little progress has been made in its elimination to date. In general, the best that has been done has been to adopt certain precautionary measures to reduce the hazard by removing from track rails which past experience has shown may be especially prone to this type of failure.

Statistics published in the last issue indicate that only approximately one heat out of every 50 reveals a transverse fissure, but that one out of every four such heats develops a second fissure and one out of every eight such heats a third fissure. In other words, this type of failure appears to be a characteristic of certain heats. For this reason, those roads which have gone furthest in the development of precautionary measures are attacking the problem in terms of specific heats. This makes necessary the development of more or less elaborate records in order to be able to locate all rails in each heat as they lay in track whenever occasion arises. No road has given more thought to the development of such a plan or has followed it more carefully than the Illinois Central. For this reason we present a description of the practice of this road on a following page.

The determination whether such detail is warranted cannot be based on any momentary comparison of its cost as contrasted with the loss resulting from derailments from fissured rail failures, for safety of travel is at stake and a single accident may lead to heavy loss of life as at Victoria, Miss., last October, when the derailment of a passenger train resulted in the death of 21 persons and the injury of 130 more. Neither can reliance be placed on comparisons of the number of failures of this character discovered for apparent immunity from this type of defect is due more commonly to the failure of maintenance officers to identify them properly than to any superior quality of material. If the repetition of such accidents as that at Victoria are to be avoided, and this is a responsibility of the maintenance of way department, the most thorough precautions must be taken with the rails in service until the conditions leading to the formation of transverse fissures are determined and corrected.

A RUSH JOB WELL DONE

EARLY IN June a new line of the Chicago, North Shore & Milwaukee was completed and immediately placed in operation for heavy traffic on a high speed schedule. While the loads carried on this line are lighter than those on main line steam railroads, limitations on the riding qualities of the lighter and shorter cars used on the electric line, make it equally necessary to have good tracks to meet the requirements of high speed operation. As described in an article appearing elsewhere in this issue, the program for the project was such that all details of the construction work had to be carried out as quickly as possible. There was no opportunity for any unusual refinement, yet when the job was completed the line was in condition for high speed service at once.

If one expects that this record is the result of something new in the way of railroad construction, he will be disappointed. Instead, a study of the work shows that it was carried out by practical men who applied well known principles of railway construction in a practical manner. It is but fair to call attention to certain circumstances favoring the result obtained on this line which obviously cannot be duplicated on all other work. In the first place, the fills are low, less than 10 ft. in all cases, thus making it entirely practicable to secure the compacting effect of placing the fill from a track raised in place rather than by dumping from a trestle. The small amount of grading also made it possible to make a large part of the embankments of material of exceptionally good character which was hauled in from a considerable distance.

With these local conditions favorable to substantial construction, certain definite measures were taken in carrying out the work which insured the construction of tracks that have been singularly free from settlement. First, pains were taken to insure that the track and roadbed are well drained. Although a grade line was established which placed most of the line on embankments the line was thoroughly ditched for a large part of its length and effective out-fall was provided for all ditches. Second, the roadbed was made of generous proportions, providing a width of 11 ft. 3 in. from track centers to shoulders and it was crowned 7 in. from the shoulders to the center line between tracks. Third, the ballasting was done by stages, first on a sub-ballast of gravel and then by two lifts on stone. Fourth, measures were taken to secure good workmanship. The ballasting gangs were small enough to insure adequate supervision.

There is nothing unusual or remarkable about these methods. They can be applied readily in the construction of any main line railroad. Such methods, properly and consistently applied, will do much to reduce the burden imposed upon the maintenance of way department when lines are turned over to them following the completion, or what is presumed to be the completion, of the construction work.

MANY DIE IN BALKAN WRECK—A train was buried in a landslide near Sarajevo, Bosnia, on July 17. The casualties reported were 117 persons killed.

How the Illinois Central Watches Its Transverse Fissures

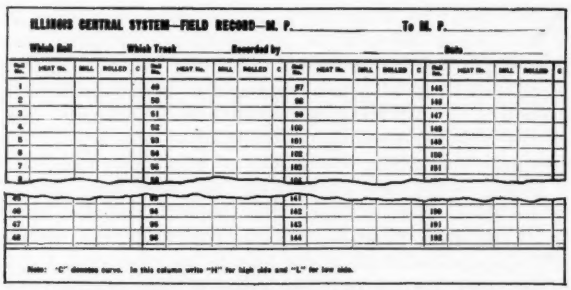
A Detailed Description of the Methods and Records Which Make Possible the Prompt Removal of Defective Heats

ONE OF THE most difficult and important problems facing the maintenance of way department is the transverse fissure. Authorities differ as to the cause of transverse fissures, but all agree that a record should be kept of rails remaining in main line tracks which are from the same heats as rails which have developed this type of failure, so that they may be removed from service before the situation becomes hazardous. The magnitude and cost of keeping detailed records of all rails in service was for a long time a barrier to the practice of removing such rails; however, in recent years a number of roads have adopted this practice. Of the various systems and methods worked out on these various roads to accomplish this end, that initiated and used on the Illinois Central is particularly interesting, as it is comparatively simple and is effective in operation.

Under this plan, a record is kept of the weight, brand, manufacture, date of rolling and the heat number, ingot number and letter of every rail in main line service, together with the exact location of each rail. This information is collected and indexed by division forces who report all transverse fissures to the office of the engineer maintenance of way, where the system records of transverse fissures are kept, and from which office are issued the instructions for the removal from service of rails from transverse fissure heats.

When the first transverse fissure is reported in a specific heat on the Illinois Central, all rails of this heat in main line service on the high side of curves over the system are removed. When four transverse fissures have been reported in a certain heat, all of the remaining rails of this heat are removed from main line tracks. The identity of these rails is made permanent by drilling a standard bolt hole in the web near the center of the rails. Such rails are then restricted for use in sidings, spur tracks, yard body tracks, etc., where the possibility of a failure would be remote and in any event, of little consequence.

Following out this practice on the Illinois Central, there were 482 transverse fissures reported during 1925, which resulted in the removal of 1,853 rails from the high side of curves, due to first failures, and the removal of 4,480 rails after reported fourth failures. This makes a total of 6,333 rails, or 19.79 track miles of rail, which were removed from main line service during the year. At a closely estimated cost of $5.75 for loss of service and for changing out each rail, it is figured that the total cost to the company in removing rails of transverse fissure heats, amounted to approximately $36,415 in addition to the expense of keeping records. Offsetting these expenditures are the intangible value of safety and the actual savings which probably have accrued through the reduction in the damage losses due to derailments chargeable directly to transverse fissure rail failures. Evidences of these savings are illustrated by the fact that whereas 15 derailments between October, 1919, and December, 1923, were chargeable to transverse fissure rail failures, involving a total loss of approximately $129,500, no reportable derailments due to this source occurred during 1924. During 1925 there were four derailments, caused by transverse fissure failures, the damage amounting to about $15,000. No such derailments have been reported to date during 1926. The number of transverse fissure failures per 100 track miles of rail in service per annum has remained practically station-


ILLINOIS CENTRAL SYSTEM—FIELD RECORD—M. P. _____ To M. P. _____

Which Rail _____ Which Track _____ Recorded by _____ Date _____

Rail No.	HEAT No.	MILL	ROLLED	C	Rail No.	HEAT No.	MILL	ROLLED	C	Rail No.	HEAT No.	MILL	ROLLED	C	Rail No.	HEAT No.	MILL	ROLLED	C
1					49					97					145				
2					50					98					146				
3					51					99					147				
4					52					100					148				
5					53					101					149				
6					54					102					150				
7					55					103					151				
8					56					104									
65					113					161									
66					114					162					190				
67					115					163					191				
68					116					164					192				

Note: "C" denotes curve. In this column write "H" for high side and "L" for low side.

The Field Record Form, One of Which is Used for Each Rail on Each Mile

ary during the past five years. Consequently the actual saving in derailment expenses shown above may be ascribed to the watchfulness of all concerned in removing suspicious rails from service promptly. The fact that notwithstanding all precautions, derailments on account of internal fissure failures still occur, may be taken as evidence of the hazardous possibilities involved if these precautions had not been adopted.

Formation of System is a Large Task

When the Illinois Central initiated its policy with regard to transverse fissure rails, it was confronted with the large task of preparing records. This consumed a period of well over a year before the system became fully operative. The first problem was that of securing the locations and the information stamped or rolled on all main line rails. This was accomplished by the division engineering forces who were at times assisted by men selected from section gangs. Usually two men worked together, covering one track at a time, one man being assigned to each rail. Beginning with the first rail on each mile, which was called No. 1, the heat number, mill, date rolled, and whether on the high or low side of curves, was noted and recorded on a special field record form which was carried on 15-in. clip board. This form is 8½ in. wide by 14 in. long, and is laid out as shown in the accompanying illustration. One form was used for each rail of each track, and at the beginning of each new mile a new form was used. Thus for every main track on each mile there are two forms containing the required information concerning every

rail. In addition to information recorded as stated above, it has, during the past year, been the policy to indicate also the ingot number and letter. As the information was secured from the rails, they were numbered consecutively from the mile post by a piece of yellow keel, disregarding all switch points and frogs, which were not numbered or recorded. Following the completion of making records for a considerable stretch of track, the rails were again counted as a check, and the numbers of the first, last and each tenth rail on each mile were then painted on the flange in bold white figures.

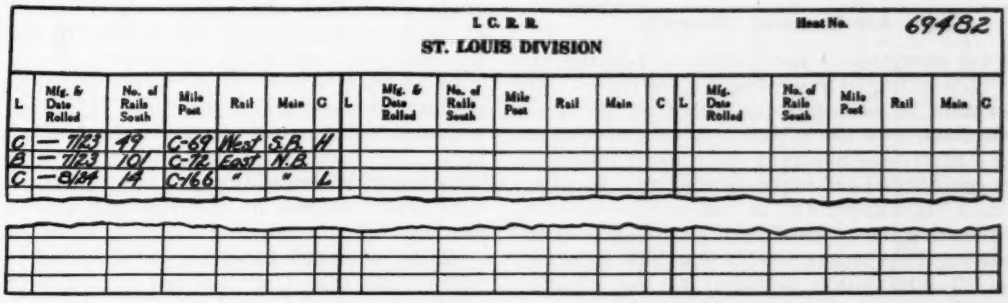
In most instances the man with a little experience in reading the markings on a rail had little difficulty in making his records. This was particularly true where rail had been in the track only a short time and where the letters and figures were still distinct. Old rails and those which had been corroded by water, brine drippings, etc., often caused considerable difficulty in obtaining readily the information sought. In these cases a wire brush was often used to advantage in removing scale from the rail, and rubbing over the markings with a piece of oily waste or with the flat side of a piece of yellow keel usually made the letters and figures stand out distinctly. The difficulty often experienced of finding the location of the heat number or other information on the rail without walking continually in a stooped position, was overcome by some of the men engaged in the work by means of a mirror attached to the end of a stick. This mirror was fastened to the stick at an angle of about 135 deg. so that when passed along the web of the rail the reflection of the markings could be seen by the man in an erect position. After locating the heat number, brand, or other markings, it was then necessary to stoop and make a reading. This mirror was also used to advantage on dark days and on the shady side of the rails to reflect light against the figures to be read. Where it was impossible to determine in full the information from the rails, owing to their condition or to disfigurement of the lettering, as much information as was obtainable was recorded even to the extent of showing only one or two figures of the heat number where that alone was possible.

Under average conditions of weather and rail, each man was able to record and paint about two miles of rails a day. Under less favorable conditions this amount was reduced considerably, while on new or practically new rail it was not uncommon to cover as much as from four to six miles in a day. Recognizing the hazard involved in this work, each man was cautioned almost daily as to the necessity of strictly observing safety rules.

With the accumulation of the field record, it became immediately necessary to provide an index whereby the location of all rails of specific heats could be determined readily from the mass of data collected in the field. For the most part, this work was carried along with the field work and was handled in the office on rainy days. As no definite standard or best practice had been devised in this regard, several systems of indexing were adopted on the various divisions, all of which have worked satisfactorily. These systems resolve themselves into three distinct types: the card index, the bound book index and the sectional book index. All of these systems are based on the heat number.

Several Types of Indexes Used

In the card index system, the field records are arranged in mileage order in a loose leaf binder and one card (6 in. by 9 in.) is provided in the index for each different heat, these cards being arranged in numerical order. In making up the index, beginning with the first rail record on the first mile covered, the heat number was recorded on the upper right hand corner of the card. Below, on the body of the card, as is shown in the illustration, was recorded the ingot letter, mill and date of rolling, rail number, mile post, which rail, which main and whether on the high or low side of a curve. In this manner, the information concerning each rail was transferred to the index in order, a new card being made out for each new heat number. As each rail was accounted for in the index, a small distinctive mark, which could be erased later, was made opposite on the field record so as to avoid making a duplicate record. The advantage in the form of indexing lies principally in that all information is available from the index, and there is not the necessity of constantly referring to the field record reports, which are in this case used only as a check.


L. C. R. R. Heat No. 69482

ST. LOUIS DIVISION

L	Mfg. & Date Rolled	No. of Rails South	Mile Post	Rail	Main	C	L	Mfg. & Date Rolled	No. of Rails South	Mile Post	Rail	Main	C	L	Mfg. Date Rolled	No. of Rails South	Mile Post	Rail	Main	C
C	— 7/23	19	C-69	West	S.B.	H														
B	— 7/23	101	C-72	East	N.B.															
C	— 8/24	14	C-66	"	"	L														

The Card Used in the Card Index System of Recording Heat Numbers

In the bound book index system, the heat numbers are indexed according to their last two figures, that is, the pages of the book are numbered 00 through 99, and the last two figures of each number govern the page on which it will be recorded. In this index, unlike the card index, the information recorded includes only the heat number followed by the miles on which rails of the particular heat are located and the number of such rails on each mile. In each case, a particular mile and the number of rails on that mile are placed one above the other and are separated by a short horizontal line.

In determining the exact location of rails of a specific heat, mill and date of rolling, in this system, the heat number is located in the index and note is made of the miles on which the rails of this heat occur and the number of such rails. Referring then

to the field reports on the mile notes, which are kept in consecutive order, it is a simple matter to determine the exact location of the rails, as each rail, as before mentioned, is numbered from a mile post.

In the sectional book index, the book provides a separate section for each year since 1910, the year when open hearth rail was first used on the Illinois Central. In this system, the heat numbers of rails are allocated to the index according to the year in which they were rolled. Within each of these sections there is a further division of the index according to the mills furnishing the rail. The pages in each of these sub-sections are headed 10,000 to 20,000, 20,000 to 30,000, etc., which figures govern the page on which heats of various mills and dates of rolling should be placed. In making up this index, a heat number not already recorded is inserted in the proper place and on a horizontal line following is listed the miles on which rails of this heat may be found. The advantage claimed for this system of indexing is that whereas there are often duplicate heat numbers from different mills, or from the same mill rolled in different years, only the location of the rails of the particular heat, mill and date of rolling will be shown in one place. For example, the location of all rails with heat number 12,642, rolled in 1915, from a specific mill, will be found on one page of the index and will not be confused with rails of exactly the same heat number but with a different rolling date, or from a different mill. Having located from the index the miles on which specific rails may be found, a check through the field reports shows the location of each rail as in the case of the bound book index.

Rails Are Renewed Promptly

With the exception of the system of indexing, the method of handling a transverse fissure report from its conception to the removal of rails from the track, is standardized over the system. A section foreman locating a transverse fissure in the track immediately changes out the rail and makes a report to this effect to his track supervisor, who in turn notifies the division engineering department through the office of the roadmaster. This report is of a standard form and contains all information pertinent to the situation including the brand, mill, date rolled and heat number of the rail removed as well as the same information concerning the rail substituted. It also shows the exact number of the rail from the mile post and which rail in the track.

After a check is made in the assistant engineer's office to ascertain that all of the information furnished concerning the rail removed is correct, a mailgram is forwarded to the engineer maintenance of way, the general manager and the district engineer concerned, which includes a complete report of the fissure rail, with the exception of the number of the rail on a certain mile which information is not recorded in the central office.

After handling in the office of the engineer maintenance of way, which is explained later, the various divisions on the system are advised concerning the transverse fissure rail failure with instructions to remove all rails of this date, mill, and heat from the high side of curves if it is a first failure, and to remove all such rails from main line tracks if it is a fourth failure. These instructions, received at the division headquarters, are then submitted to the office of the assistant engineer where from the records previously described the exact locations of all rails in question are listed and a copy sent to the foreman concerned. On at least one division a special form has been devised for sending this information to the supervisors and thence to the foremen, which form shows the exact location of each rail affected with complete instructions for interpreting the form and with regard to handling the matter to completion. Under instructions to give this matter preferred attention, the rails so indicated are removed from the track at once and a standard bolt hole is drilled in the web near the center of each rail to indicate that they are of a transverse fissure heat. Where rails of one, two or three transverse fissure heats are left in tangent main line track, they are marked distinctively by a broad stripe of yellow paint on the flange near the center of the rail which is for identification in making periodic inspection of the rails while in main track service.

When main line rails are removed for any reason whatever, the foremen report to the division assistant engineer on a special form, the location, brand, mill, heat number and date rolled of each rail removed, and the same information concerning the rails which are substituted. With this information the field reports and index are changed and kept up to date. Where questions arise concerning the correctness of the information received, or where a large amount of rail is re-laid, the engineer in charge of heat numbers on the division obtains the correct information in the field. Following a complete change in the records, the office of the engineer maintenance of way is advised concerning the changes and also with regard to the number of rails of the heat removed and the number of the rails of this heat still remaining in service.

In addition to the special forms and methods described, another important form submitted to the engineer maintenance of way is the road's standard form 1137, "Report of rail failures in main track." This report is similar in many respects to the standdard report adopted by the American Railway Engineering Association, and is used in reporting all other types of rail failures as well as transverse fissures. The report is made out by the foreman and after being checked and typed in duplicate in the office of the assistant engineer, one copy is sent to the engineer maintenance of way, one copy is retained in the file, while the original report is sent back to the foreman concerned with instructions as to how to paint the failed rail. The original report is returned later to the assistant engineer and is held in his file. In the orderly conduct of the work on some of the divisions, several other record forms of minor importance are used such as a current record wherein is shown the status of the handling of open accounts and a special blue print form of the same nature which lists the names of the supervisors, the number of rails of certain heats which they have been instructed to remove from the track and the date so instructed. This latter form is kept open until all supervisors concerned have reported the rails removed, thus precluding the possibility of rails of transverse fissure heats being left in the track through carelessness or oversight. On account of the changes that are continuously being made in track forces, and the necessity for educating such men to recognize and differentiate between the different

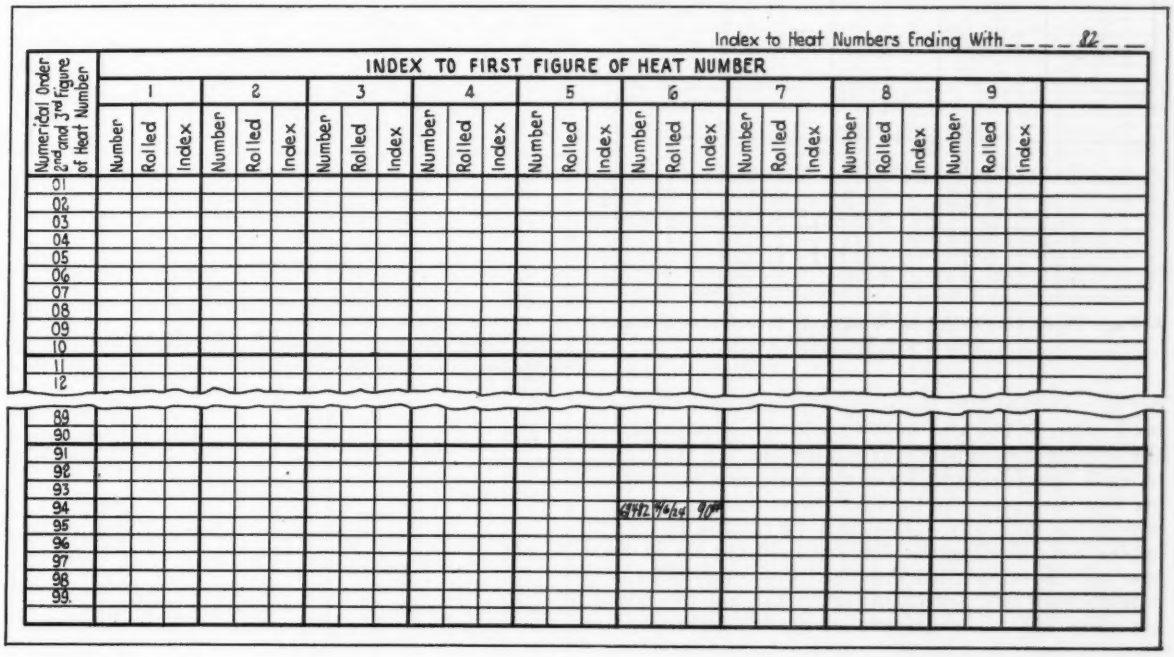
types of failures, it has been found advisable to assign one man for this work. He travels over the entire system on a motor-car or hand-car, accompanied over each section by the foreman of that section and usually by the road supervisor.

System Centralizes in General Offices

The whole system of recording heat numbers and transverse fissures, as is the case with all other types of rail failures, is centralized in the office of the engineer maintenance of way. Here the division reports are received, checked and recorded, and from this office originate the instructions to remove rails of such heats as have been found to contain more than the maximum allowable number of transverse fissures. Having available the summary of all division reports, this office also prepares an annual rail failure report which indicates the number and character of all failures, collectively and separately, the brand, location as regards division, and such other data, including deductions made from the records submitted and recommendations which may be of assistance to the management.

The actual keeping of records in the central office is in charge of one man and the system in vogue makes use of four record books. These are designated and referred to as the "master heat number book," book "A," book "B," and the "blue print summary book." The first of these mentioned, the master heat number book, is 23 in. high by 14 in. wide, and has a filler of 100 cloth backed pages. This book contains a record of all heat numbers on the system, together with the date rolled, weight, and any special index as to the character of the rail, as titanium rail, frictionless rail, etc. The manufacturer of the rail is also made evident by inserting all of the heats of a particular mill in a color distinctive from that used for heats from other mills. The information included in this book is secured direct from the company's rail inspectors at the various mills who furnish, together with other information at the time of shipment, the heat number, brand, date rolled, etc., of all rails.

By reference to the illustration of the page form used and the heat numbers listed, it will be noted that the page of the book on which a heat number is listed is governed by the last two numerals of the numbers, that is, the 100 pages of the book are numbered consecutively, 00 through 99, and the last two numerals in the particular heat number listed being 82, puts it on the page so numbered. The specific location on the page is governed by the horizontal row of figures at the top of the page which represent the first figure in each number, and the vertical column of the two unit numbers at the left hand edge, which represent the second and third digits of the heat numbers. Thus, any five-figure heat number between 10,182 and 99,982, and any four-figure number between 1,082 and 9,982 will be recorded on the page illustrated. The color in which the listing is made indicates the mill at which the rail was rolled. Where two similar heat numbers occur, each having different dates of rolling or from different mills, they must be crowded into the one space provided for that particular number.


Index to Heat Numbers Ending With 82

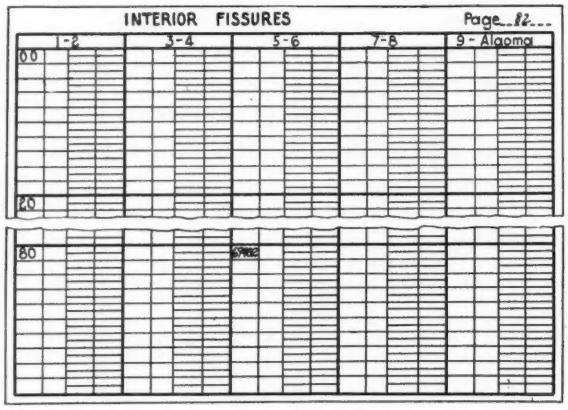
Numerical Order 2nd and 3rd Figure of Heat Number	INDEX TO FIRST FIGURE OF HEAT NUMBER																											
	1			2			3			4			5			6			7			8			9			
	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	Number	Rolled	Index	
01																												
02																												
03																												
04																												
05																												
06																												
07																												
08																												
09																												
10																												
11																												
12																												
89																												
90																												
91																												
92																												
93																												
94																6182 6614 90												
95																												
96																												
97																												
98																												
99																												

A Page From the Master Heat Number Book in Which are Listed all Heats on the Railroad.

It is obvious from the above that although there may be a hundred or more rails of the same heat and date scattered over the system, each heat of a specific mill and date is recorded in this book only once. The function of this record is to ascertain promptly whether there are rails of a certain heat on the system and to check reports of transverse fissure failures in certain heats to be sure that through errors in reading, heats are not reported which are not actually on the railroad.

Book A is in some respects similar to the master heat number book in that it has 100 pages about 10½ in. high by 8½ in. wide, numbered consecu-

tively from 00 to 99, these numbers having reference to the last two figures of each heat number recorded. Across the top of each page there are five headings, 1-2, 3-4, 5-6, etc., which refer to the first figure of a heat number. The left hand column of figures, set off in sections from 00 to 20, 20 to 40, etc., correspond with the second and third figures of the heat numbers, and indicate the line on which the heat should be placed. Taking for example the same heat number as was placed in the sample master heat number book page, 69482, this would be listed on page 82 in the column 5-6, opposite group 80-100. To the right of each space provided for the heat number there are five divisions, the first for inserting the date on which the rail was rolled and the following four spaces for recording the dates of failures. As in the case of the master heat number book, the heats of various mills are distinguished by the use of different color ink. The importance of this record is to show at once the transverse fissure heats which have been reported and whether they have been reported one, two, three or four times.



A Page From Book "A" in Which all Transverse Fissure Heats are Recorded

Book B is the current record of transverse fissure heats in which are recorded the fissure rail heat numbers and the number of rails of these particular heats which are still in service and the number which have been removed from the track. As rails of a certain heat may be scattered over the system, this book shows the information by divisions. The book is 10½ in. high by 9½ in. wide and is bound in loose leaf form. Separate sections are allotted to the heats of the various mills and as a limited number of heats are reported each year the various number in each section are listed by the first figure only. When a fourth failure is reported in any heat it is customary to put a red circle around the heat number so as to make it stand out and furthermore to call attention to those heats of which there should be no rails left in the track.

TRANSVERSE FISSURE FAILURES

Rem. - Remaining in Service
Re. - Removed

Heat No. 69482 Date Rolled 10/9 Date Failed 6/3/25 Div. St. Louis Report No. 11

Chgo. Term.		Illinois		St. Louis		Sp'fld.		Indiana		Wisconsin		Minnesota		Iowa		Kentucky	
Rem	Re	Rem	Re	Rem	Re	Rem	Re	Rem	Re	Rem	Re	Rem	Re	Rem	Re	Rem	Re
4	12			9	6					12	3			18	10		

Tennessee		Miss.		Louisiana		Memphis		Mfrs. Term.		N.O.Div.		N.O.Term.		Vicksburg		E.St.Louis	
						14	4					20	5				

Heat No.		Date Rolled		Date Failed			Div.			Report No.			
Chgo. Term.		Illinois	St. Louis	Sp'fld.	Indiana	Wisconsin		Minnesota		Iowa		Kentucky	
Tennessee		Miss.	Louisiana	Memphis	Mfrs. Term.	N.O.Div.		N.O.Term.		Vicksburg		E.St.Louis	

A Page From Book "B" Which Shows the Number of Rails of Transverse Fissure Heats Removed and Still in Main Line Service

At the end of each year the information contained in this book is transferred to the blue print summary book, which as the name implies, is a cumulative summary from year to year of all transverse fissure heats. This book is 11 in. high by 8½ in. wide, and is divided into distinct sections for recording separately transverse fissure heats of each mill. In each section heats appear in numerical order, the new heats recorded being inserted in the proper place when the book is revised at the end of each year. As shown by the typical page illustrated, the information recorded includes the heat number, date rolled, number of failures, rails in the heat, rails in service, rails removed from the high side of curves, dates fissures were reported, the division reporting and the report number. While three of the heat numbers shown have been reported only once, number 10977 has been reported three times by the divisions indicated, on the dates recorded. In this particular case, four divisions had rails of this heat on the high side of curves, which rails are shown as having been removed. The fourth failure having not been reported on any of the heats listed, rails are shown as still in service on tangent track.

90# OPEN HEARTH STEEL RAILS
ROLLED BY ____ CO. AT ____
WHICH HAVE FAILED IN MAIN TRACK
AND FOUND TO CONTAIN
INTERIOR FISSURES.
AS REPORTED BY DIVISIONS TO JANUARY 1, 1926.

Heat Number	Date Rolled	Number of Failures	Rails in Heat	Rails in Service	Removed from high side of curves	Date first fissure reported	Division and Report No.
1.	2.	3.	4.	5.	6.	7.	8.
10463	11-22	1	189	-		10-18-25	Tenn. 654
"	"			18	6		La.
"	"			16			Mfrs. Div.
"	"			0			Chgo.Term.St.Louis
"	"			0			Spfld, Ind.
"	"			0			Wis. Minn. Ia.
"	"			0			Ky. Miss.N.O.Div.
"	"			0			N.O. Term. Vix.
"	"			0			K. St. Louis
10685	10-10	1	180	46	4	6-12-23	La. 3.
"	"			13			Mfrs. Div.
"	"			5			N. O. Term.
"	"			0			Chgo. Term. Ill.
"	"			0			Spfld, Ind.
"	"			0			Mfrs. Term.
"	"			0			N. O. Div.
"	"			0			Vix., Iowa.
"	"			1			Miss.
10977	10-11	1+1+1		2	2	7-6-22	Ky.-146
"	"			1	1	9-6-22	Mfrs.Term.-41
"	"			0	6	4-7-23	Chgo.Term.-10
"	"			0			Ind.,Spfld.Ill.
"	"			0			St.Louis, Wis.
"	"			0			Ia. Minn. Ky.
"	"			0			Tenn. La. Mfrs.
"	"			0			Div., N.O.Term.
"	"			0			Vix., N.O.Div.
"	"			9	6		Miss.-6
10988	10-11	1	108			11-11-20	Ky.-9
"	"			19			Mfs. Div.
"	"			5			Mfs. Term.
"	"			12			Vix.
"	"			0			Minn. La. Chgo.
"	"			0			Term. N.O.Term.
"	"			0			N.O. Div. Ia.
"	"			1			Miss.

A Page From the Blue Print Summary Book, the Cumulative Report on Transverse Fissure Rails

When a fourth failure occurs in a heat, the heat number is recorded in summary sheets at the back of the book which show according to mills, the heat number, date rolled, number of rails in the heat, number removed, and the divisions that have not yet reported. When all divisions have reported, the total

number of rails removed should equal the total number reported in service in the front pages of the book plus the number of rails which were formerly removed from the high side of curves. All of the records in this book are transcribed from the information contained in the master heat number book and books A and B.

Operation of System is Not Complicated

While it may appear that the records kept are copious, the actual keeping of the records and the handling of all matters pertaining to them are comparatively simple. When a mailgram is received from a division reporting a transverse fissure failure, the heat number, manufacturer, and date of rolling are checked by referring to the master heat number book wherein are recorded all heats on the railroad. If the heat number reported or the date of rolling is incorrect, the division reporting the failure is advised immediately by mailgram and asked to examine the rail again to check the essential data.

If the heat number and date of rolling are correct, book A, containing a record of all transverse fissure failures is consulted to determine whether the failure is the first, second, third or fourth. If it is the first failure, a form letter, over the signature of the engineer maintenance of way, is sent out to all general superintendents and district engineers advising them of the first failure in the heat and requesting that they instruct those concerned to remove all rails of this heat from the high side of curves, and subsequently report the number of rails removed and the number remaining in service. In the event of a fourth failure a similar letter is sent out with instructions that all rails of the defective heat be removed immediately from the track and that advice be forwarded regarding the number of rails removed. In the case of all transverse fissure failures, record is made of the date of failure in book A, the new heat number being added in the proper place if it is a first failure. A first failure is also listed in book B and information from various divisions, as to the number of rails removed and the number remaining in service is entered in the regular form under it. Similarly, when a fourth failure is reported the heat is noted in book B, where it is made to stand out by some distinctive mark until all the divisions have reported that they have removed all main line rails of this heat. At the end of the year all of the information contained in books A and B is transcribed into the annual blue print summary.

Following a mailgram reporting a transverse fissure, the engineer maintenance of way is furnished with a detailed report of the rail and failure on the road's standard form 1137 "Report of rail failures in main track," previously referred to, which contains all information pertinent to a thorough study of the cause and character of the fissure, and also to the compilation of data regarding this class of failures.

Early in the year a typewritten detailed report regarding all rail failures during previous years, accompanied by tables and charts, is submitted to the chief engineer and the engineer maintenance of way, outlining collectively and individually the status of rail failures during the year in comparison with previous years, and furthermore as between the rails rolled by the various mills. In addition to this summary of all records and facts collected during the year, the report contains also detailed explanation of any unsual figures presented and in addition conclusions derived from a careful study of the situation.

In addition to the value of such a report in the hands of the engineering officers, the safety assured through the removal of transverse fissure rails, and the facilities with which this is made possible, the records kept on the Illinois Central are made available to the appropriate committee of the American Railway Engineering Association on forms provided for the purpose, and in conjunction with other such information available, form the basis of study and research which may ultimately eliminate or at least greatly simplify the problem of transverse fissures.

The system of running down and removing rails of transverse fissure heats as inaugurated and applied on the Illinois Central was developed and has been carried out under the direct supervision of A. L. Davis, principal assistant engineer. This work is under the general direction and supervision of A. F. Blaess, chief engineer, and L. H. Bond, engineer maintenance of way.

Channel Change in the Schuylkill River at Port Clinton, Pa., Enabled Reading to Eliminate Two Bridges and a Tunnel

Burlington Systematizes Handling of Its Bridge Materials

More Careful Programming Insures Better Use of Equipment and Reduces Costs

WHEN HEAVY rains and swollen streams washed out numerous bridges and 50 miles of tracks on an important line of the Chicago, Burlington & Quincy in Wyoming in 1923, the promptness with which all the materials were brought in and the line restored to traffic demonstrated the importance of close co-ordination between the bridge and the supply departments. While particularly evident in this instance, this co-ordination also exists in the handling of routine bridge repairs, where it has been productive of marked economies.

Whereas not many years ago there was a pile driver for every division, an equal amount of improvement work is now being done with only nine pile drivers for the 20 divisions and with practically no delays in the delivery of material while work train service has been greatly reduced. This has been accomplished in the main through the development of a system, the outstanding characteristics of which are the practice of the system bridge engineer to issue all requisitions for the material needed and to assign all work equipment and that of the supply department to ship the material only when the bridge engineer calls for it and then always in complete form, loaded in such a way as to facilitate handling when received.

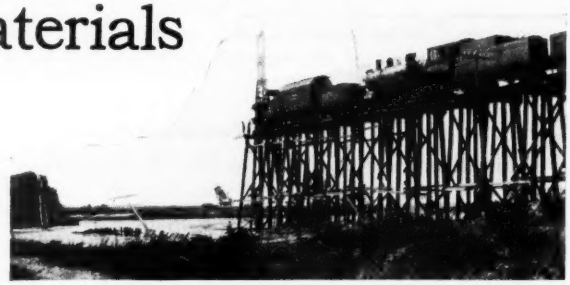
The procedure begins with the division master carpenters. It devolves upon them to make their recommendations each fall for the renewal of pile bridges. These recommendations are then forwarded to the bridge engineer who with the assistance of

Line	AFE No.	Br.No.	Material Requisition Numbers: Piling	Ties	Trtd. Lumber	S.H. Lumber	Hdw.	Misc.
AURORA DIVISION								
Montgomery-Streator	16214	63.18	4667	4668	4669	4670	4671	4672
Streator-Walnut	16087	24.83	4673	4674	4675	4676	4677	4678
" "	16217	34.87	4679	4680	4681	4682	4683	4684
Flag Center-Rockford	16219	11.12	4685	4686	4687	4688	4689	4690
" " "	16220	22.79	4691	4692	4693	4694	4695	4696
Forest City Branch	16221	0.48	4697	4698	4699	4700	4701	4702
GALESBURG DIVISION								
Galesburg-Savanna	9177	223.79	4703	4704	4705	4706	4707	4708
Fenton Jct.-Ebner	16227	67.98	4739	4740	4741	4742	4743	4744
Galva-Gladstone	16315	41.76	4745	4746	4747	4748	4749	4750
Galesburg-Quincy	9179	177.48	4751	4752	4753	4754	4755	4756

Bridge Engineer's List of Requisitions Covering Material for Lines East, Pile Trestle Renewals

system supervisors of bridges personally inspects all the structures posted for repair or renewal. The bridges needing replacement are placed on the budget for the following year.

The budget is usually completed and approved early in December, whereupon bills of material are made up by the bridge engineer covering all material required for the program. The bridge engineer then prepares the requisitions for the material for



Redriving a Trestle Across a Washout Near Bonneville, Wyo., With Emergency Material in 1923

each bridge, which requisitions are completed early in the year—usually during the month of January—and delivered in one lot to the general storekeeper, who also receives a recapitulation list showing the A. F. E. numbers, the bridge numbers and the requisition numbers grouped according to divisions. This is completed before formal authority has been secured for each project, but informal authority is given the general storekeeper by the operating vice-president to fill such requisitions on the request of the general manager or bridge engineer. The supply department is thus in a position to make preparations for deliveries in advance of the time they are to be made.

Supply Department Prepares Own Advance Estimates

The supply department's preparations for procurement, as distinguished from deliveries, however, are begun a year in advance of the arrival of requisitions. This is because of the practice of treating most of the timber now used for bridges on this road, which calls for from eight to ten months' seasoning. To meet this condition the stores department makes its own estimate of the requirements. This is determined from reports received from lumber yards of this road, of which there are two, one located at Galesburg, Ill., 150 miles west of Chicago, and the other at Sheridan, Wyo., 150 miles east of its western terminus at Billings, Mont. At both places, this road operates tie and timber treating plants. Reports received from these yards give the quantity of each kind of bridge material on hand, the amount due, the amount on order, the consumption of the previous year, the month's supply on hand and the surplus, if any. These reports are received by the chief tie and timber inspector who determines the requirements and, through the general storekeeper, issues on the purchasing department all orders for the material necessary to replenish stock. The stock is thus replenished on the basis of past consumption as determined from the supply department's record.

By the time the requisitions are received from the bridge engineer, the piling and timbers have been procured and are seasoning in the yard. From 85 to 90 per cent of all of the piling used on bridges on the Burlington is cypress, obtained from Mississippi and Arkansas and reaching the Burlington through St. Louis, Mo., and Paducah, Ky. In order to reduce back haul, all of this cypress piling is stored at Galesburg. The remainder of the piling is western red cedar which, though inferior to cypress is acceptable

for use in dry climates where the driving is not so hard. Again in the interest of reducing haul, this cedar, which comes from Idaho, is received and held at Sheridan, Wyo. On the other hand, the bridge timber is Douglas fir, all of which is obtained from the Pacific coast through the Billings (Mont.) gateway. In this case, considerations of haul result in all lumber used on the lines west of the Mississippi River and also that required on these lines across the river as far east as Galesburg being received at Sheridan, while the remainder is shipped from the coast direct to Galesburg to supply the lines east, north and south of that point.

Since the lumber is secured on the basis of prior consumption rather than knowledge of the exact held at one point, the cedar at another and the jurisdictions for remaining material equally well understood, it is a simple problem for each yard to ascertain its own responsibility for the material called for.

Separate Requisitions Are Prepared

When the requisitions are prepared, the material for each bridge is covered by separate requisitions. In addition, the practice is followed when ordering the material for a bridge of preparing one requisition for the piling, another for the lumber, one for the ties, and one for the hardware. In every case these requisitions show the person to receive the material, the place of shipment, the bridge number, the A. F. E. number and the account, but they do

J. 6-23. 30M
MAKER'S No. _____ Form 4194-B

Burlington Route

Chicago, Burlington & Quincy Railroad Company

REQUISITION FOR A. F. E. MATERIAL

Lincoln, Nebraska, June 30 1926

To the Store Department at Chicago
Please Ship to C Holmberg
At Bellwood, Nebr the following Material
For use on Bridge 64.96 and
TRANSPORTATION RATE _____ Charge to A. F. E. No. 983 Account No. 212
Approved _____

_____ STORE
Filled by _____
Date Filled _____
Car Initials and No. _____
Priced by _____
Price Chkd. by _____
F. O. B. Chkd. by _____
DEPARTMENT No.
W-5608

CHARGES FOR TRANSPORTATION OVER OUR LINES						Number or Quantity Ordered	DESCRIPTION	Mat'l Class. No.	Weight or Number Issued	PRICE	UNIT	AMOUNT	
Shipped from (Point where received on C. B. & Q. Line)	Weight Lbs	Miles Hauled	Ton Miles	Amount									
						150	8"x10"-10' creo fir br ties						
						260	8"x8"-10' Ditto						
						13	8"x8"-10' fir br ties card process						
							Cy:FRM-GAH						

Separate Requisitions are Prepared for Piling, Lumber, Ties and Hardware for Each Structure

requirements and because of its being subject to the demands of emergency and special work as well as for regular bridge programs, it eventually becomes important to check the quantity on hand against the actual requirements. The original bill of material which is made out by the bridge engineer is of assistance in this respect. Two bills of materials are prepared, one for the lines west of the Missouri river and the other for the lines east. Each comprises a single blueprint which shows in tabulated form for each division the number of each kind of caps, fenders, packing blocks, of sway bracing, of bridge ties, of bulk heading, of flooring, and of piling and also of the amount of each kind of hardware for a division. As soon as these bills of material are issued copies are sent to the officer in charge of each material yard with which to check up the material in stock. With the two yards organized as described, it is obvious that the yard on the lines east will have some material in stock for the lines west and likewise that the yard on the lines west will carry some material for the lines east, but with all the cypress not designate the time of shipment for reasons to be explained later. Five copies of each of these requisitions are prepared, one going immediately to the consignee and one being retained by the bridge engineer, while the other three go to the general storekeeper where they pass to an A. F. E. desk. The initial action at this desk is that of checking the requisition against the recapitulation list of jobs as prepared by the bridge engineer. One copy of each requisition is then kept on file while the other two, including the original, are sent to the source of supply. Here the purpose of separate requisitions for each class of material becomes operative. If the bridge is on the lines west but in the section where cypress piling is specified, the requisition for the cypress goes to Galesburg on the lines east, while the requisition for the hardware and lumber goes to Sheridan. The requisitions for the material having been forwarded, the situation remains in status quo until the order comes to ship.

This order, as before stated, comes from the bridge engineer who issues it as soon as it is certain that

the work on the bridge in question will be undertaken. The bridge engineer can do this since it devolves upon him to assign the pile drivers. The practice is for the bridge engineer with the assistance of two supervisors of bridges—one for the lines west and one for the lines east—to develop a program under which the pile driving work is done. This program is developed in such a way as to provide for the driving of all piling on any line while the driver is passing over it, thus reducing the movement of drivers to a minimum. The program fixes the tentative date for the driving on each line, but as the season advances it devolves upon each division superintendent to inform the bridge engineer when he needs or can use the pile driver. The two officers arrive at the best date under the circumstances for the work and the supply department is advised to ship the piling. Instructions to ship the remaining material are given later. Usually the requests for shipping material involves a series of bridges.

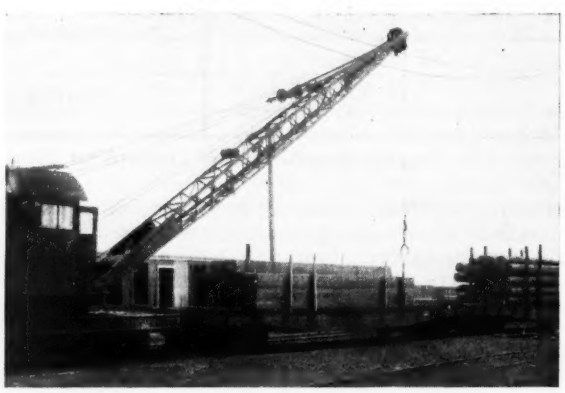
A Portion of the Bridge Material Storage Yard at Galesburg, Ill.

All Material Is Shipped Together

When instructions to ship are received by the stores department, the store department's copy of the bridge engineer's recapitulation of jobs furnishes a convenient means of determining the requisitions covering the material for the jobs in question and instructions are immediately transmitted to the holders of requisitions, whereupon the storekeepers at the supply points place in the hands of the proper loading foreman the carbon copies of the requisitions which were previously sent to these supply points. The loading of piling and lumber is accomplished by a traveling crane and the material is loaded on flat cars. In exceptional cases coal cars may be used for this purpose. Usually the loading of the material for one bridge is completed before the work of loading material for another bridge is started. Where small shipments are being made, the material required for one job is invariably separated from the material for another job. This is accomplished by laying strips between the material on which the order numbers are marked and also by expressly tagging the material wherever this is considered necessary. Moreover, in loading material for several points, the shipping is planned so that the material for the nearest point is placed on top, while that for the most remote point considered in the shipment is placed on the bottom so that there is no confusion on the line in unloading the proper material as each job is reached. Finally, the material for a bridge is all shipped at the same time, except only where piling is to be shipped before the other material. Where a job requires materials from Galesburg and Sheridan, shipments, of course, are made from both points, but with the above qualifications all of the material called for in the requisitions at each point, including the hardware, goes forward in the one shipment.

Shipping notices are sent out on the same day as the material is shipped so that all parties concerned can make the proper arrangements for handling and for the additional purpose of furnishing the bridge foreman with the information with which to check quantities. The shipping notice corresponds to an invoice. Where the material is shipped in "peddler" cars the way bills also furnish an itemized list of the material, which is acceptable for checking purposes. With these precautions, there is little chance for confusion at destinations over what material should be unloaded, in those cases where material for more than one bridge is shipped on the cars reaching the job.

While this method reduces in no wise the responsibility of this road's division organization for the upkeep of its bridges, it provides for effective coordination of the division organization with officers of special qualifications for the work and familiar with policies and needs from the system standpoint. One result of this is the opportunity for greater standardization of material and the elimination of sundry waste and confusion through the personal contact of the bridge engineer with inspection work and the preparation of all requisitions at one point.



All Material is Loaded on Flat Cars for Shipment to the Job According to Schedule

From strictly operating viewpoints, present methods are particularly interesting by reason of the better utilization of work equipment. As stated above, each division was formerly equipped with a pile

driver, each of which required a work train. There are still four of these machines available for use in emergencies or on special work where a work train must be employed at all events, but with the bridge engineer responsible for the assignment of this power, the work formerly done with this equipment is now being accomplished with eight machines which, being self-propelling, largely dispense with work train service, as well as affording the advantages that come from the all year-round pile driving crews.

Of equal importance with this reduction in investment for machinery and the cost of operation through better utilization is the improvement that has taken place in the supply situation. However, delays in delivering material and shortages persisted even after the supply department began to secure its requisitions from the bridge engineer. The difficulty at this time was attributed first to the practice of prescribing the dates of delivery on requisitions which was done according to the schedule of work made out by the bridge engineer. The trouble with this plan was its inflexibility, for as the season progressed material was being delivered to jobs where it was not immediately needed because of revisions in the original schedule, while material required at other jobs had not yet been shipped. This led to the plan of omitting the dates of delivery from the original requisition and of placing the responsibility on the superintendents to issue instructions when deliveries should be made. But this did not remedy the trouble for division superintendents in their desire to be certain of having material would commonly call for deliveries well in advance of needs. Thus one superintendent who seemed most anxious to co-operate with the stores department in its problem was found to have called for deliveries for all the material for his 28 bridges in the same month.

It was these experiences that resulted, therefore, in the adoption of the practice of holding all material in the yard until the receipt of instructions to deliver and of so arranging that the instructions would come only from the bridge engineer after he and the superintendent had agreed in every case upon the time when work on specific bridges should be done. For the current year this road has 250 bridges on its program for renewal work which require approximately 170,000 lin. ft. of piling. These bridges are in process of repair at the present time.

Stores Officers Favor Delivery By Supply Train*

AFTER careful consideration and investigation, the committee finds that the following list of materials may be economically delivered by supply trains:

Station tools and supplies (including baggage and other station trucks).
Section tools and supplies (including hand cars and push cars).
Other track material, such as angle bars, bolts, spikes, tie plates, etc.
Oils.
Gasoline.
Posts, wire and other fence material.
Frogs, switches, guard rails and fittings.
Signal and interlocking materials.
Water treating plant supplies (including soda ash, lime and chemicals).
Pump house supplies.
Stationery.
Cement (small quantities only).
Grain doors and coopering material (small quantities only).
Material and supplies for small car inspection points.

The delivery of switch ties, concrete and other heavy pipe, also small quantities of rail and lumber, is being handled successfully on several railroads, but it is not a general practice.

Operating in Congested Territories

Many supply department officers have held the opinion that supply trains cannot be operated successfully in congested traffic territories, but the following is a report received from a railroad which operates a supply train successfully on a 60-day basis in what is probably the most congested traffic territory in the United States:

This railroad operates through the most heavily populated region in the United States. It is mainly an industrial section and the railway system which serves it is the result of some 80 years of development, which included several mergers. As a result, the road in its efforts to provide adequate service to all parts of its district operates a great many branch lines and the region affected is literally a network of tracks. For this reason, this railroad has been justly described as a huge terminal in itself and if this idea is borne in mind, a better understanding of the situation will be had.

The supply train on this road encounters congestion at other than terminal points. For instance, on one busy division 180 passenger trains and 70 freight trains are operated daily. A four-track system being used here, the usual procedure is to assign the supply train to track 2, when traveling east, leaving track 4 for all locals. Express and freight trains running on track 2 can easily be run around the supply train by means of the high-speed cross-overs located about six miles apart, thus eliminating any possibility of delay.

Close co-operation between stores department and operating departments is necessary to get the desired results, for with traffic concentrated, it is necessary to run the train on a track against the current of traffic for a short stretch. Often the successful completion of the day's movements will depend on such a move.

Likewise, this railroad operates its supply train successfully in its large terminal. More than 500 passenger trains are handled daily in this terminal, most of which move between the hours of 7 to 9 a. m. and 4 to 7 p. m. Through an understanding with the train dispatching officers, the supply train is permitted to operate on the main line from about 9 a. m. to 3:45 p. m., and in this way all tower, station, freight house, yardmaster's and lampmen's supplies are delivered, including stationery and oils. One of the towers thus handled is a mechanical tower of 172 levers making more than 1,100 movements a day. All supplies are left here, as at smaller towers, including 600 gal. of oil drawn from the supply train's tank cars and placed in the tower's storage tanks.

When any work is to be done in a congested yard, the supply train is usually placed on a track where no lead track will be blocked for any length of time, and little difficulty is thus met. The supply train under discussion covers its entire system of 2,400 miles every 60 days, delivering material to all stations, freight houses, towers, yardmasters, lampmen, sections, etc. To the sections all track

*Abstracted from a report of the Committee on Line Delivery of Material, presented at the Seventh Annual Meeting of Division VI, Purchases and Stores, of the A. R. A. at Atlantic City, N. J., on June 11

tools, spikes and bolts are delivered, but angle bars, tie plates, frogs, or switches are not handled.

The experience of this railroad clearly demonstrates the practicability of operation under congested traffic conditions.

Picking Up Scrap

Practically all railroads follow the practice of picking up scrap by supply trains. However, it was found that some railroads run scrap cars over the line, independent of their supply train movement. The committee feels that the picking up of scrap is an essential part of the supply train operation.

The committee recommends the use of a gasoline-operated crane for the loading of scrap and the handling of heavy materials such as frogs and switches. The lower operating cost makes the gasoline crane preferable to the steam crane. Several railroads have added gasoline cranes to their supply train equipment during the past year.

Very few railroads are following the policy of delivering stationery from supply trains. Railroads handling stationery by supply train report a substantial reduction in their stationery expense.

In previous years the committees have consistently recommended 30-day delivery of materials by supply trains. A canvass of various railroads develops that some railroads are operating supply trains and supply cars every 30 days throughout the year. Other railroads, operating on a 30-day basis, run the trains only 9 or ten months out of the year. A number of railroads report that they are operating successfully and economically on a 30-day basis.

Your committee feels that this is a matter which should be decided by the individual railroads dependent upon conditions existing on their properties.

C. L. WRIGHT,
General Storekeeper (M.-K.-T.), Chairman.

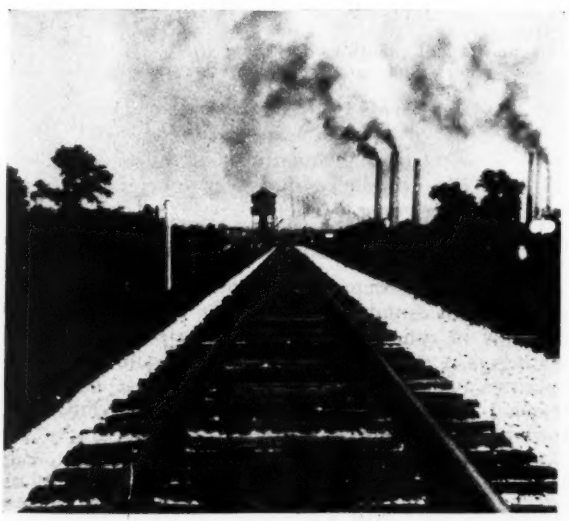
Discussion

In discussing this report, U. K. Hall (U. P.), stated that on main lines where the delivery of material is heavy, there is no question but that 30-day delivery is preferable. On less important lines where the materials being used are not as heavy, possibly 60 or 70-day delivery would suffice. Chairman Wright replied that it costs from $1 to $1.50 per mile to operate a supply train and that deliveries should be made as often as necessary. For years he operated on a 30-day basis but finally decided on a 60-day basis, since which time he has not increased his line stock. The service is just as good, and he has cut his operating costs 50 per cent. The committee has found in its investigation that more railroads every year are adopting the 60-day basis, but has not found one yet that has returned to the 30-day basis.

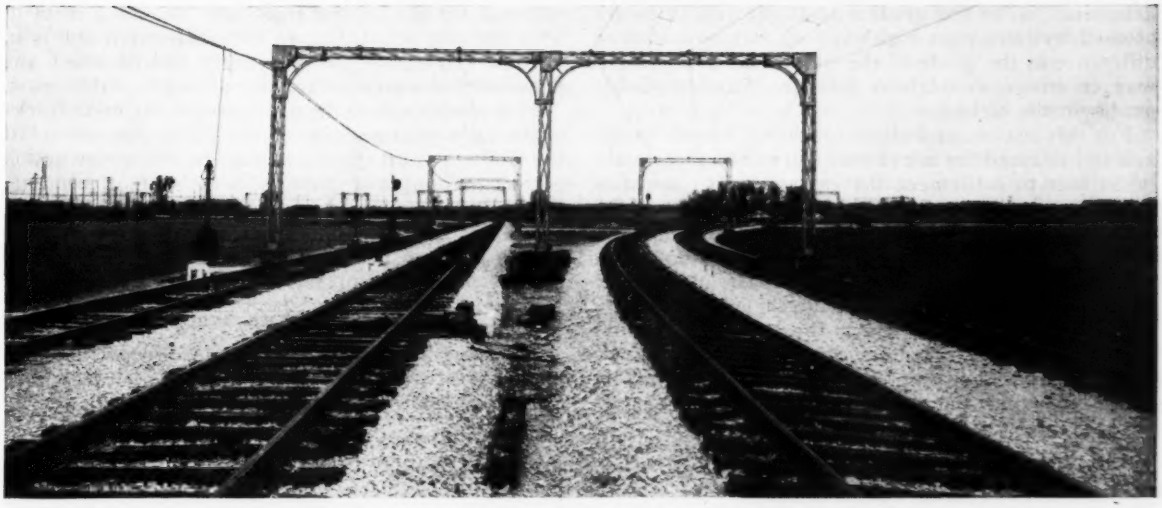
C. C. Kyle (N. P.), described the experience on the Northern Pacific with the supply train. It was installed several years ago on the 30-day basis, and was operated on a 30-day basis with many interruptions until finally the 60-day schedule was adopted. They found that it has not increased the investment in line stocks to any great extent.

A. S. McKelligon (S. P.), advocated the 30-day schedule on the main line where any amount of material is used. He stated that just as soon as a change is made from 30 to 60 days, which has generally been forced on the stores department by the operating department, there is an increase in the stock and investment and a loss of needed supervision. It is simply the difference between doing the work right and not doing it. Thirty-day service for a heavy traffic line gets the best results.

A Supply Train on the Union Pacific



On the Erie West of Lima, Ohio



The Junction at North Upton Where the New Line Joins the Libertyville Branch

Trains Run at High Speed Over Newly Completed Track

Special Construction Methods Followed on the New Line of the Chicago, North Shore & Milwaukee Make This Possible

EARLY IN June of the present year the Chicago, North Shore & Milwaukee completed 25 miles of new line which was immediately placed in service as part of the route between Chicago and Milwaukee on a schedule requiring speeds as high as 60 miles per hour. On June 24, less than three weeks after the opening of this line, 160,000 passengers were handled over it between Chicago and Mundelein, Ill., on the occasion of the ceremonies that marked the close of the twenty-eighth Eucharistic Congress of the Catholic church.

To place this double-track line in condition for a dense and high speed service in less than one year from the time the construction was started, within four months after the first section of the track had been given its first running surface and without any real opportunity for seasoning, represents an unusual achievement in railway construction. It was possible only because of the special precautions taken in the construction of the roadway and the track, and an account of the measures thus put into effect will prove of value to railway officers who may be confronted with similar problems.

The Chicago, North Shore & Milwaukee is an electrically-operated railroad extending from Evanston, Ill., to Milwaukee, with trackage rights into Chicago over the Chicago Rapid Transit lines. The original line of this railroad lies parallel to the shore of Lake Michigan through a highly developed suburban area north of Chicago. There is also a branch line from Lake Bluff, Ill., west to Mundelein, known as the Libertyville branch. About a year ago this railroad completed a branch line from Howard street, Chicago, west for a distance of five miles, to serve a new suburban development in the vicinity of Niles Center. The new line, which is known as the Skokie Valley line, comprises an extension of this Niles Center line in a northerly direction parallel to and from 1 to 3½ miles west of the old main line along the lake shore towns. This line makes a connection with the old line at Lake Bluff.

The functions of the new line are two-fold; first, to relieve congestion by diverting the through trains from the old line which carry the heavy suburban passenger business between Chicago and the north shore towns; and second, to afford transportation to a large area which lies in the logical path of the growth of suburban development.

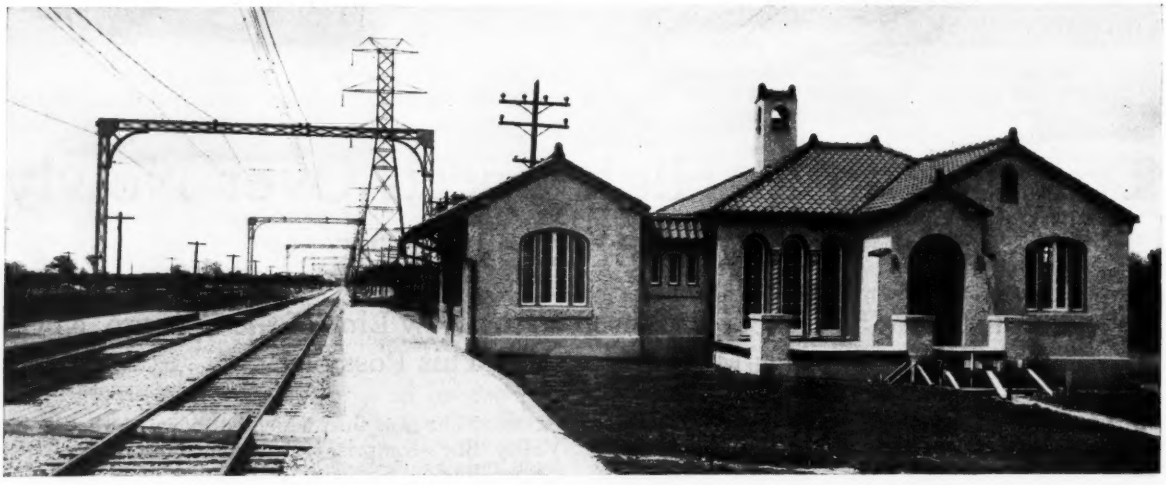
The Location Borders the Skokie Marsh

The line is located in a broad valley lying parallel to Lake Michigan and from which it is separated by the ridge occupied by the north shore suburbs. The southern end of this valley comprises what is known as the Skokie marsh, large areas of which have been made available for various kinds of development through the conduct of drainage work. However, even the portion of the line lying beyond the north limits of this marsh is comparatively flat, and the highest part of the line between Niles Center and Lake Bluff is only 30 ft. above the lowest portion.

For almost the entire distance from Niles Center to Lake Bluff the new line was located parallel to a double-track main line of the Chicago & North Western. Various considerations favored this location and through the Skokie Marsh it has the advantage of being far enough away from the lowest part of the marsh to avoid trouble from soft foundations for the embankments. The location parallel to the Chicago & North Western also influenced the

determination of the grade line as the two lines are crossed by numerous highways so that any marked difference in the grade of the two tracks at the highway crossings would have introduced objectionable grades in the highways.

For this reason, and also to insure adequate drainage and to avoid the use of material in fills that would be subject to settlement the embankment quantities greatly exceed those in cuts. Furthermore, the ordinary practice of building the embankments from borrow pits on the right-of-way was not followed in construction since the fundamental basis of this line demanded a material other than that furnished by the territory traversed where the loamy soil would require a certain period for settlement with the attendant evils of water pockets where the ballast would settle into the roadbed. Aside from these considerations, it was not desirable to excavate borrow pits owing to the difficulty in draining them satisfactorily and their unsightly appearance in a suburban territory.



Typical Track Construction and Passenger Station on the Skokie Valley Line

Most of Filling Material Obtained From Borrow Pit

As a consequence, the excavation along the line of road totalled only 132,000 cu. yd., while the volume of material required for the fills was 682,000 cu. yd. The remaining 550,000 cu. yd. was obtained from a borrow pit near Mundelein at the end of the Libertyville branch. This plan entailed a long haul, but as the material obtained from this pit is entirely sand and gravel, it insured the making of embankments with material that is subject to no delayed settlement.

This material, after being stripped of its overburden of loam, was loaded by steam shovel and hauled by train to the new line where it was unloaded from a track laid on the ground on the center line of the double track, with only enough surfacing to allow the cars to be pushed over it for unloading, the track being raised as the unloading progressed. The width of finished embankment is 36 ft. and this method permitted the fill to be raised to grade and widened to full width with a Jordan spreader without shifting the track. After the embankment was completed the track was lined to its proper position as one of the double tracks by means of a Nordberg track shifter, after which the track material for the second track was unloaded from it. This method resulted in an embankment which is in effect a sub-ballast in its entirety and in which the possibility of water pockets is reduced to a minimum.

This plan involved the use in one of the main tracks of the rails employed during the filling operation, but the rails passed through the entire construction period without any trouble from surface bending. The only precaution taken in this regard was to lay the 90-lb. relayer rail in those portions of the line where the construction of heavier fills introduced greater possibility of settlement.

Deliver Track Material With Tractors and Trailers

In laying the first track a radical departure was made from ordinary practice in that the ties, rails and other track materials were received at nearby railroad stations and hauled to and along the line by trucks of large capacity drawn by caterpillar tractors. This method greatly expedited the laying of the track by permitting work to proceed at a number of points, with the added advantage of avoiding interference with the work trains hauling the filling material.

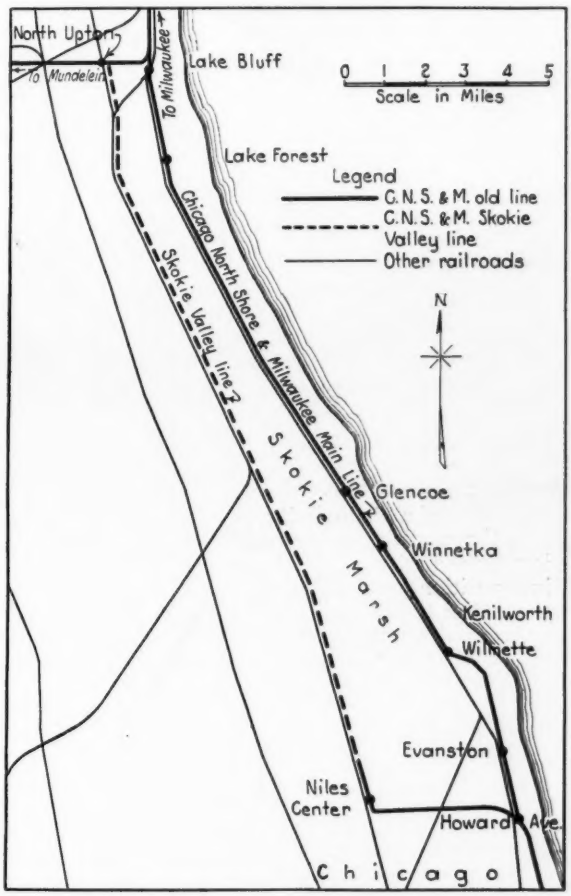
Another measure which had an important bearing on the development of a substantial roadbed as free as possible from all settlement, was a thorough system of drainage. Not only were all cuts ditched to insure that they drained effectively, but a large part of the embankments were flanked by side ditches to guard against saturation of the sub-soil. Particular pains were taken also to insure that all ditches had an effective out-fall so that all water draining into the ditches would run away.

Details of the Track Construction

Except for the 90-lb. relayer rail mentioned above, the line has been laid with 100-lb. rail. Creosoted red oak ties were used throughout, and will be fully tie plated before the end of the present summer. All tracks on curves and all tracks through interlocking plants were fully tie plated before the line was put into operation. The track has an average of 12 in. of ballast under the ties. The roadbed is crowned so that it is 7 in. higher on the center line between tracks than at the edges of the shoulders. With the tracks spaced 13½ ft. center to center and a 36-ft.

roadbed, the shoulder is 11 ft. 3 in. from the center line of track.

The first step in the ballasting program was to give the track a good running surface on two to four inches of gravel sub-ballast obtained from a pit on the company's lines near Libertyville. It was necessary to do this work as quickly as possible after any section of the roadbed grading was finished, in order that the line could be used for work train service, which was required not only for the handling of ballast and track materials for the second track, but also for other construction operations such as the erection of the transmission and conductor systems for electric operation, the building of sub-stations, etc. Some idea of the extent of this work train service is to be had from the fact that the railroad employed 11 steam locomotives in handling work



The Skokie Valley Line in Its Relation to the Older Lines of the C. N. S. & M.

trains. The operation of this number of trains for a period of as much as four months on some portions of the track during the construction period was unquestionably of value in giving the track some measure of seasoning before revenue operation was started early during the present summer.

Rock Ballast Placed Under Track in Two Lifts

Following the placing of the sub-ballast the line was given two lifts on crushed limestone ballast to a total of about 8 in., this stone being obtained from the Racine Crushed Stone Company at Racine, Wis. In order to compact the ballast as effectively as possible, every effort was made to plan the work in such a way as to allow as long an interval of time as possible between the making of the two lifts. However, the ballasting program could not be carried out to any exact plan as it had to be done in a way that would avoid any interference with work train service or other details of the construction work on the line, such as the erection of the overhead bridges for the electric conductors, the stringing of the conductors, and other work incidental to the completion of the line. For this and other reasons, the ballasting was done with relatively small gangs averaging about 30 men each.

The new track rides well and the schedules have been maintained with ease since the opening of the line. While the equipment does not impose the loads on the track equal to those of steam operation, the fact that the scheduled speed of trains is high and that the cars are shorter and not as heavy as those used on steam lines, imposes severe requirements on the track to develop good riding qualities.

Since the line has been completed extra gangs totalling from 200 to 300 men have been employed in spot surfacing for the purpose of putting the line in final shape for winter. Unusual rainfall during the month of June and the correction of such settlement as has occurred as a consequence of the heavy rain, it is believed, will place the line in such condition that it can be turned over to the regular section forces for the winter without any occasion for the employment of extra gangs next summer.

The construction of the line was under the supervision of D. H. Howard, engineer of construction for the Chicago, North Shore & Milwaukee. Much of the work was done under contract by the L. E. Myers Company, while the remainder was done by company forces.

How to Program Bridge and Building Work*

By W. V. Parker
Foreman Bridges and Buildings, St. Louis Southwestern

THE RAILROADS of this country have an investment of about three billion dollars in bridges, buildings and other structures of like character. Proportionately, this will show that our road has no small amount invested in structures of this kind. This means that the bridge and building program should be prepared and executed with the utmost precision, which not only contemplates the laying out of the work on a set program for the various jobs, but also the expenditure of money for labor and material, especially labor, for the most productive return possible. It is very important, as the management is watching costs so keenly, that great pains be taken in estimating and preparing our material programs, eliminating all possible surplus which would lead to waste.

I would like to suggest to, and if possible impress upon, the foremen in the maintenance of way department, the importance of keeping a proper record of all expenditures of labor and material, for their own files, although this probably will not work so well with the track men as it does with the bridge and building department. These records should consist of a report of

* From a paper presented before the fifth annual meeting of the Sanitary Engineering and Maintenance of Way Departments of the St. Louis Southwestern, at Paragould, Ark., on June 16, 1926.

the condition of the property, the amount of labor and material used, and the general condition of the jobs when finished. It ought to be so arranged that the foreman can take an interest in the job as he finds it and his superior show an interest in the job as he leaves it. This will have a tendency to improve the character and speed of his work to a remarkable degree.

The importance of a railroad's relations with the public is probably appreciated more by railroad employees and officers today than ever in the past. The upkeep of stations, ticket offices, waiting rooms, baggage rooms and station grounds is an important phase of a railroad's relations with and service to the people and exerts a strong influence on public opinion, which is just as essential to the profitable management of a railroad as it is for any other industry. More thought and care should be devoted to this matter of general upkeep as a channel of railroad publicity, for it will be found to pay good dividends and be fully appreciated by travelers and shippers. This is one item that we should not overlook when preparing our program. Every community has its own individual pride; a good looking station or grounds in the next town have no relation to the town you are in, nor do they interest those people at all. They want their pride in their own town recognized by the railroad's keeping up its property in their town in an attractive way. This will be helpful to the railroad in the maintenance of public good will.

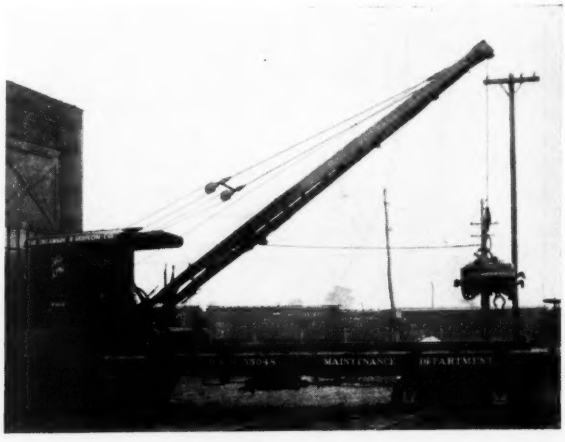
It is not possible to instruct or suggest to each member of this organization of railroad men how he shall proceed to establish a permanent system of an all-the-year program. Standardization secures economy in design, manufacture, construction and maintenance; it makes for safety by facilitating understanding on the part of each employee; it is altogether essential to modern industry. But it tends to crystallization, to discourage improvements. Progress is not change merely, but change for the better, and standardization which is so rigid that it prohibits change, prevents progress.

Responsibility develops strength in all classes of men, and the responsibility that the bridge and building and track foremen have for the bridges and roadway has necessarily made each of them a strong and reliable member of the maintenance department. Organization and systematic handling of both labor and material should be the watchword of all of us. Be a man who is always studying to do things a little cheaper and a little better; a man who is not only interested in the material which he is handling, but also in the systematic workings of the organization of which he is a part.

Maintenance of way men, as well as supply men, must get away from the idea that their payroll is the measure of their efficiency. They must get away from the idea that constructive criticism should be resented; they must take on the full responsibility of their duties; they must realize the need of action, then act; they must encourage, receive and accept criticism in a constructive way; they must make themselves a real constructive force instead of a destructive one. All departments should co-operate with the single purpose of furthering the best interests of all, and, in doing this, it will be found that the best co-operation exists where each department and each individual does his whole duty. When this is done, it will be found that the desired results are obtained with the greatest satisfaction to all and to the best interest of the railroad.

Making a Light Crane Pay in Maintenance of Way Work

AN ILLUSTRATION of the service rendered by cranes in the maintenance of way department is afforded by the use which the Delaware & Hudson is making of such equipment for handling track materials and scrap. The crane is a 5-ton unit operated by a gasoline engine and is of the revolving type, equipped with small double-flanged wheels so that it may be run on a track of six feet six inches gage on one or more flat cars. It is provided with rail clamps which may be applied wherever necessary for stability. It can also be locked at one end of the car and connected to a car axle



One of the Important Uses Made of the Crane Is Handling Scrap Material

by means of a chain and gear so that the entire unit is self-propelled by the crane engine. The crane is provided with a 28-ft. boom which, when lowered into position for road travel, does not project beyond the end of the car.

As used on the D. & H., the crane is equipped with chain slings, a ⅝-yd. clam shell bucket and a magnet. The magnet is 36 in. in diameter and is energized by a 4½-kw. generator which is belt-driven by the engine.

One of the principal uses to which the crane has been put is in work train service for the loading and unloading of rails and other track materials. Rails are handled by means of a special rail clamp, while frogs, switch material, tie plates, etc., are handled most effectively by the magnet. When equipped with the bucket, the crane is used in widely varying services for handling dirt, sand, coal, cinders and other materials.

Another important use made of the crane, when equipped with the magnet, is in handling scrap at the storehouse and in supply train service. Being mounted on a flat car it is connected into the supply train and used to unload heavy material at section tool houses, and to load scrap material from the bins into the scrap car. This greatly facilitates the movement of the supply train over the road and eliminates the necessity of sending many men with the train or holding section crews at the tool houses to assist in unloading or loading material. The crane was built by the Universal Crane Company, Cleveland, Ohio, and the magnet and generator unit by the Ohio Electric & Controller Co. of Cleveland.

Fire in Deck Puts Large Bridge Out of Service

Falsework Built to Restore Traffic Will Also Serve for Repair Work on Steel Spans

ON the evening of May 5, a fire broke out on the east end of the double deck railroad-highway bridge of the Chicago, Rock Island & Pacific over the Mississippi river at Inver Grove, Minn., completely destroying the highway flooring, ties and other timbers in the four spans immediately east of the draw span, and causing so much damage to the structural steel work that it was deemed necessary to place them on falsework before restoring traffic.

Opportunity for crossing the river on another bridge by way of a detour that entailed no delay to traffic, made it possible to conduct the construction of falsework and replacement of the railroad deck of the Inver Grove bridge in a well considered manner, with the result that the falsework built to restore traffic is also designed to facilitate the work of replacing damaged members of the steel superstructure. This, however, did not result in any delay in carrying out the construction of the falsework and it was completed in about 91 hours after the fire.

The Faces of the Stone Piers and Copings Were Shattered in Many Places by the Heat

The bridge is 1,625 ft. long and consists of 18 fixed spans and a draw span. Beginning at the east end the bridge is made up of one 50-ft. through plate girder span, six 140-ft. through pin-connected trusses, and a 440-ft. draw span. West of the draw span there are 12 through plate girder spans, which vary in length from 40 ft. to 25 ft., there being eight 40-ft. spans, three 30-ft. spans, and one 25-ft. span at the west abutment. All of the spans rest on stone masonry piers. The bridge was built in 1895 by the South St. Paul Belt railroad and is a double deck structure carrying a single track on the upper deck and a vehicular roadway below.

Fire Does Considerable Damage

The fire, which occurred during the night of May 5, originated on the east end of the bridge under the highway deck, over pier No. 3, supporting the ends of two of the through pin-connected trusses.

The Fire Was Confined to the East End of the Bridge by Opening the Draw Span

The exact origin of the fire has not been determined. Augmented by a high wind, the fire spread east over span No. 2, destroying the timber highway floor and joists in several panels, and then spread west over spans No. 3, 4, 5 and 6, where the greatest damage occurred. Progress of the fire beyond span No. 6 was prevented by the timely opening of the draw span.

Owing to the high wind from the southwest, the most severe damage was done to the highway floor structure and the truss members on the upstream side of the bridge. All of the floor beams of the highway deck on spans 3, 4, 5 and 6 were badly distorted, having been twisted, bent and buckled by the heat of the burning timber flooring. The members of the bottom system of truss laterals on these spans were also badly burned and elongated so that they will have to be replaced. On the north side of the trusses, where the flames were blown directly against the members, the greatest damage was done to the eye-bars in the bottom chords which were badly burned and so distorted that they did not recover their original positions or lengths. The posts, diagonal counter bars and rods on this side also suffered slightly from the extreme heat to which they were exposed, although, as this was confined to the portions in direct contact with the flames which extended about four feet above the eye-bars,

it will not require the replacement of these members.

The eye-bars and other members on the downstream side of the bridge did not suffer so severely from the heat since the flames were blown away from them. However, because of the proximity of the interior string of eye-bars on this side to the burning floor structure, these bars were burned and many were greatly elongated. Since all of these bars were undoubtedly elongated to some extent, and in view of the desire that each bar in a packing take an equal share of the total stress, all of the inside eye-bars will probably require replacement.

The piers under the burned out spans, all of which are of stone, were also damaged considerably by the

Six Four-Pile Bents Were Driven at the Panel Points Under Each Damaged Span

fire, the sides having flaked off in numerous places owing to the effect of the extreme heat. The copings were also severely shattered by the heat, particularly at the corners. Practically all of the damage to the piers and copings, however, was confined to the surface, and as none of the bearings were affected, the strength of the bridge supports was not impaired.

With the exception of the ties, guard rails, walkway, one floor beam and one stringer bracket in the upper part or railroad floor of the bridge in the spans affected, all of the floor beams, stringers, truss laterals and other members were found in good condition, in spite of the evidence that they had been subjected to considerable heat. This situation made possible the ready repair of the bridge and the early resumption of railroad traffic.

Pile Bents Take Loads

While the fire on the Inver Grove bridge occurred late in the evening of May 5, by 5:30 on the morning of May 7, two pile drivers were driving falsework under the damaged structure. On May 9 at 5:55 p. m., the work was completed and the bridge opened to railroad traffic. During the fire and the driving of the falsework, trains were detoured over the Mississippi river bridge of the St. Paul Bridge & Terminal Railway, which is located about five miles further up the river. One of the pile drivers employed was owned by the Rock Island, while the other was borrowed from the Chicago, Milwaukee & St. Paul. The pile drivers worked from opposite ends of the burned out section of the bridge, driving the falsework until they met.

The piles used in this work were of cedar, 65 ft. and 80 ft. in length, and the speed with which they were procured was due to the fact that they were available on the open market in St. Paul. These piles were driven as close as possible to each panel point, four to the bent, and six bents were placed under each of the four most seriously damaged spans. While the driving of successive bents took place, the piles already in place were cut off and capped with 12-in. by 12-in. timbers, at a convenient elevation for wedging up under the stringers of the railroad deck. In all cases the bents were double sash and sway braced with 3-in. by 10-in. planks which were bolted to the piling by ¾-in. bolts.

While no time was lost in determining the exact location of each pile, care was taken to locate the bents and each pile so that it would not interfere with the replacement of the damaged bridge members, and also so that they would serve as falsework for carrying out this work. As finally placed, the bents were made to carry all of the live load on the bridge and a large portion of the dead load, with no indication of settlement or extra burden. During repair work it is planned to wedge up the spans on the falsework still more, to relieve them of practically the entire dead load and thus permit of ready removal of the injured members. Two 4-in. or 6-in. by 12-in. timbers will then be bolted on each side of the piles

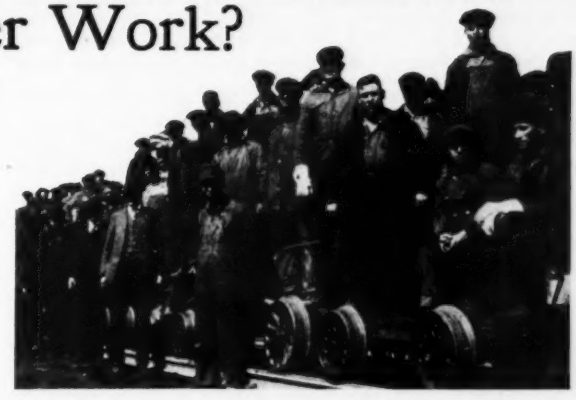
The Flames Distorted the Eye-Bars on the Upstream Side and Burned the Truss Columns and Diagonal Counters

in each bent, above the present middle 3-in. by 10-in. sash braces, and cantilevered out on the upstream and downstream sides of the bridge to provide bearings for longitudinal timbers and flooring for carrying on the work of replacing the damaged eye-bars, stringers, etc. The total cost of repairing the bridge is estimated at approximately $29,000.

HEAVY WHEAT MOVEMENT—All railroads are requested to have the distribution of box cars given continuous and close attention to avoid any possible car shortage in the period of heavy wheat movement now impending. The winter wheat movement is under way in heavy volume, particularly from Texas and Oklahoma, where a crop second largest in the history of these states is being harvested. Cutting and threshing of grain is proceeding rapidly northward through Kansas and into Nebraska.

Is it Practicable to Increase the Amount of Winter Work?

Further Discussions Elicited by the Contest on the Means Whereby a Uniform Work Program May Be Obtained



More Uniform Employment Will Reduce Summer Forces

IN this issue are presented abstracts of papers received in the contest on the practicability of increasing the amount of winter work, the prize-winning papers having been presented in the June issue of *Railway Engineering and Maintenance*, while other papers of merit received in the contest were presented in the same issue as well as in the July issue. The number of papers received in this contest and their treatment of the problem testify to the interest taken in a study of the means to establish an orderly program which will eliminate to a great extent the feverish activities of a comparatively short working season. There is no doubt that the proper measures tending to maintain a body of experienced, loyal men in the maintenance department will result in economy and efficiency and these papers are valuable in showing the methods which have been adopted to secure this result as well as in pointing out the pitfalls to be avoided.

The Economics of Winter Work

By A. M. BOUILLON,
Chicago Terminal Improvements, Illinois Central, Chicago

Because of the wide range of conditions existing on different railroads, especially major conditions such as climate, financial resources, availability of labor, nature of traffic, periods of concentrated seasonal traffic, etc., the systematic distribution of maintenance work that will insure maximum returns at the minimum of cost, is naturally subject to variable interpretation by different railroads, according to the degree of importance attached to the various conditions.

Due largely to the well directed activities of the American Railway Engineering Association, expressed through the very capable work of its various committees, and the alert and helpful educational articles in railway maintenance publications, considerable improvement has been made, particularly during recent years, in the way of systematic maintenance by the principal railroads of this and other countries. A report of the Committee on the Economics of Railway Labor of the A. R. E. A., says, "It has long been recognized in industry that uniformity in volume of work and continuity in operation are essential to the maximum efficiency and that as these decrease the cost of the work rises," and also that "The seasonal character of much maintenance of way work makes a uniform force impractical on many roads, particularly in the more northerly climates, although not to the degree commonly believed."

The writer, who supervised considerable construction and maintenance work during 14 years on one of the railroads in Canada, can testify to the accuracy of the above quotations. Such work as the renewal of ties, roadbed shouldering and re-ballasting, etc., are not practical activities for winter on any railroad where the roadbed freezes. The principal winter maintenance work carried on by the northern railroads, as observed by the writer, consists mostly of shimming the tracks to offset the unequal upheaval due to frost action; the removal of snow and ice from station platforms, and other structures along the tracks and ice that forms in springy cuts, tunnels and snow sheds.

The drainage of wet cuts involving the construction of tiled and rock-filled ditches was done successfully on the Mountain division of the Grand Trunk Pacific (the most northerly of the transcontinental lines) during the winter of 1918-19. The fact that the ground was frozen involved more costly digging but meant an equalizing saving in cribbing. The necessity of track shimmings is frequently due to bad drainage of the roadbed that could in most cases be corrected by proper drainage. Other winter work that could be planned on northern lines includes train-haul filling and bank widening during the periods of slack winter traffic, insuring the last possible interference from the regular trains. Similar work, including the removal of sliding cuts by steam shovel and train haul, re-propping for river bank protection, pile driving to hold sliding banks, digging trenches and laying water and sewer pipes, etc., are some of the jobs done during winter on the Grand Trunk Pacific which could easily be handled by the company's forces.

The wear and tear on a railroad goes on regardless of the seasons, and the maintenance organization must make good the deterioration to enable the property to do its work. The more efficient this organization becomes, the better it will be for the property, and as a means to this end the stabilization of labor effected through the programming of the work throughout the year is an object worthy of study and trial. On some of the railroads, particularly the southern lines, it should be possible to so equalize the work as to maintain practically the same force throughout the year. While such equalization would not be possible on the northern lines some improvement might be made in a general way that would result in benefit to employers as well as to the employees, since permanent employment insures greater efficiency, loyalty and contentment on the part of the employees, no matter how humble the work may be.

Winter Work Makes Possible More Productive Work in Summer

By J. H. O'Brien,
Roadmaster, Chicago, Rock Island & Pacific, Des Moines, Iowa

While all classes of maintenance and construction work on a railroad cannot be done in the winter, our experience of the past few years has proved that much of the work performed by section forces can be done in the winter just as economically and well as in the summer. As soon as the roadbed starts to freeze in the fall section men should be put on repairing and rebuilding fences, starting the gangs at the same time so that comparison may be made of the amount and cost of the work done by each gang. With sod on the ground where fence work is to be done, the frost will not penetrate deep enough to interfere with the work before it is completed. During the summer the cleaning of the right-of-way may be confined to that absolutely necessary around road crossings, within yard limits and a short distance on each side of the track, leaving the general cleaning until cold weather. A program of work necessary for changing out curve worn and defective rail, defective angle bars and renewing spikes should be prepared and the material assembled, so that during the winter section gangs can be used on this work, putting the track to perfect gage as it is spiked and taking advantage of any thawing days to tighten bolts. Frogs and switches should be repaired, bad plank in public and private crossings changed out, ties to be renewed, marked and new ties for replacement distributed on outlying sections. In fact, all odd jobs should be cleaned up, leaving the track forces free to take care of tie renewals and track work as soon as the frost leaves the ground.

By taking advantage of the maintenance work possible during the winter, forces may be concentrated on other classes of work during warm weather, and a more uniform program of work can be followed, thereby creating a rivalry between gangs, which tends to better and more efficient results. Steadier employment of labor is made possible and as a result, the men become more skillful in their work, more contented and therefore more efficient.

Conditions Not Favorable for Extra Gangs

By John Evans
Division Engineer, Michigan Central, Detroit, Mich.

While recent winters in this locality have not been characterized by long periods of extremely low temperatures, weather conditions have nevertheless been unfavorable for carrying on heavy track maintenance work with extra gang forces. There has not been enough snow at any one time to hamper railroad operation, but there has been enough for the greater part of the winter to make such work as rail relaying progress slowly, resulting in high cost. In addition to the snow there has frequently been present a thin coat of ice over the ties, and the removal of this in preparation for relaying work is expensive, if carefully done, while if not carefully done, the quality of the work is apt to be unsatisfactory.

During the winter individual members of the gang are off of their own accord more frequently than during favorable weather, while many do not care to endure the exposure to cold weather. On account of weather conditions lay-offs for the entire gang are more or less frequent and sometimes of considerable duration. It is difficult to conduct the work efficiently unless the members of the gang are kept regularly at work in assigned positions. Frequent sudden changes from favorable to unfavorable weather conditions interfere with that advance planning of work which is so important if satisfactory results are to be obtained; the shortness of the working day during the winter months has some detrimental effect, while interference with railroad operation incidental to track work is more objectionable during the winter than at any other times of the year.

In this locality there is usually an opportunity to keep a part of the extra forces busy during the winter on construction work on tracks being built for the railroads or for industries. During the past winter a part of the extra gang men were willing to remain in the vicinity of large terminals, working on the track from time to time when emergencies made it necessary to have extra help. In this locality the time of suspension of work during the winter is usually shortened somewhat through the necessity of doing some work for a time after the beginning of winter in order to complete the previous season's program.

Plenty of Productive Work Can Be Done

By G. S. Crites
Division. Engineer, Baltimore & Ohio, Baltimore, Md.

The clearing of right-of-way and station grounds of dead wood or of overhanging limbs and growths that may obstruct economical mowing can best be done when the leaves are off the trees and the ground is frozen, as the growths can be seen and judged better when there is no foliage. The cleaning out and restoring of top ditches should be done with the clearing and grubbing. While there may be no direct economy in doing such work during freezing weather, there must be a considerable force in the winter to keep the line open, and when other demands do not take their time, work of this character can be done which would be a burden during the busy working season. Tiling wet cuts can be done in some ground conditions cheaper while the soil is partially frozen than otherwise and more capable and efficient men are available for the work.

Ash pit cinders, which are often a burden during the winter, are excellent for bank widening and are a weedless material for berms. If a locomotive crane is furnished the cinders may be placed where ballasting with stone or gravel is programmed for the coming season, and thus much bank and berm can be made ready for the early receipt of ballast. A good craneman will distribute the cinders so that a minimum amount of shaping up is necessary. Other work that can be done in winter includes renewing tie plates, laying rail, distributing ties, cleaning yards and repairing or rebuilding fence.

The whole proposition of doing constructive maintenance work during winter months resolves itself down to budgeting the work properly and then laying out the plans and programs for carrying it through. The main advantages are getting a smooth riding track as early in the season as possible; having a minimum of traffic interruptions during the fall peak business; eliminating insofar as possible

shifting labor and labor camps during the summer and fall months, and working towards a larger, permanent, contented personnel.

True Economy Demands a Program for the Entire Year

By O. SURPRENANT
Roadmaster, Delaware & Hudson, Schenectady, N. Y.

The maintenance of way department cannot afford to continue its work with the ideas of yesterday. We have learned through practical experience that money spent for labor brings very small returns, hence it must be reduced to a minimum and to attain this we must program ahead so as to keep the track forces as uniform as possible throughout the year, diverting from the summer program all work that can be performed during the winter season. By doing so it will be possible to use smaller standard forces throughout the year. From my experience I know that the following classes of work can be done during the winter months: Laying new and relay rail and turnouts; installing tie plates and rail anchors; renewing worn out angle bars; gaging and tightening bolts; building right-of-way fences; unloading and distributing ties; making standard approaches on crossings; removing abandoned tracks and structures; loading waste cinder accumulations for distribution; loading scrap rails; and cutting brush along the right-of-way.

To carry out a year around program co-operation must be had from the management. By that I mean that all materials must be delivered in proper time so that the regular force can do the work without hiring unskilled labor on account of late deliveries of material. Progamming, when linked with close supervision, will reduce the cost of labor.

New Drainage System Cuts Maintenance of Track Pan Installation

UNTIL its recent correction, one of the most difficult drainage problems encountered on the New York Central was in providing for the immediate removal of water from the tracks in the immediate vicinity of its track pans at Huron, Ohio, where at frequent intervals each day through-

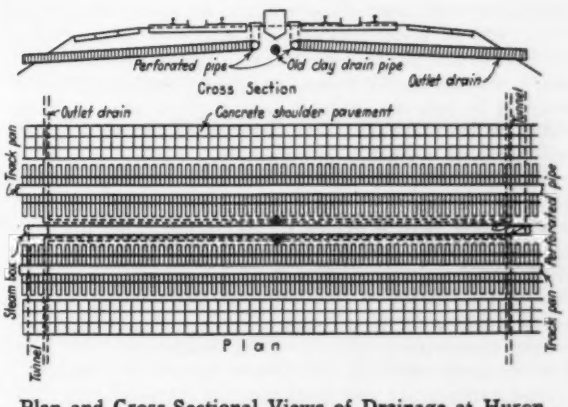
General View of Track Pan Installation at Huron, Ohio

out the year large quantities of water are thrown on the track within a short space of time. An old system of drainage had been installed at this point, but through years of service this had become so ineffective and track maintenance costs through the pan territory had become so large, particularly during the winter months, that a complete new system of drainage was installed in the summer of 1925. This new system was somewhat more elaborate than the old layout and deviated from it in the amount and method of placing the pipe and also in that the new installation was made of Armco perforated iron pipe, a recently developed adaptation of corrugated iron pipe to sub-drainage problems. The new drains were installed without disturbing the old pipe and all of the work was done without interference or delay to traffic.

The track pans were installed at Huron in 1906 on the double track main line of the New York Central. As with similar installations, their purpose is to decrease the running time of all trains over the division and especially that of the trains in through passenger service. Each pan is 2,400 ft. long and consists of a metal trough 22 in. wide and 6 in. deep, notched about 1½ in. into the ties. Water is supplied to the pans by a pumping plant situated alongside the track and about equi-distant from the ends of the pans. To keep the pans free from ice in winter, live steam is discharged into them at intervals from a steam pipe line carried in a wooden steam box placed between the tracks. Steam and water pipes enter the pans through dead-end tunnels spaced about 220 ft. apart.

Old Drainage Had Become Ineffective

Drainage was originally provided in the Huron track pan territory by a single line of vitrified clay pipe placed under the steam box. This pipe became clogged with silt after a number of years and its usefulness was so greatly impaired that drainage practically ceased, resulting in constantly wet banks



Plan and Cross-Sectional Views of Drainage at Huron Track Pan

and ballast. While this made bad track the year around, the greatest difficulty was experienced in the winter time when water thrown by engine scoops would fall into the ballast and freeze, resulting in heaved track which had to be taken care of by shimming. Ice would also accumulate on the ties

and along the rails to such an extent that an extra gang of about 20 men was required almost constantly to keep the tracks clear.

In the summer of 1925 the advisability of improving the drainage system was taken under consideration and the causes of the unsatisfactory results obtained from the existing drainage system were investigated. Upon opening the steam box it was found that its entire bottom had become filled with silt carried by the water from the pans. This deposit had become solidly compacted and practically prevented any further percolation of water through it. There was also every indication that this condition existed beneath the steam box as well and that the old drain had therefore become permanently ineffective as an outlet of surplus surface water.

Upon the disclosure of this condition it was decided to proceed at once with the installation of a new drainage system to replace the old one, and one which would have a high and constant drainage efficiency in addition to having ample strength to support whatever loads might be imposed upon it. The plan adopted was to place two lines of Armco perforated pipe under the ballast for the full length of the pans, one line on each side of the steam box. In elevation the perforated pipe slopes downward each way from a point midway between tunnels to a low point at each tunnel where a cross drain of perforated pipe provides an outlet under the tracks to the side of the embankment. At the high point between tunnels a tee was placed extending to the surface and provided with a cover. This was to permit examination of the drain and also flushing if this should become necessary. The perforated pipe was then covered with ballast for its entire length.

Since the new drain was installed in the summer of 1925 an opportunity for testing its efficiency was provided by the unusually prolonged winter of 1925-26, throughout which the drainage system operated so satisfactorily that the supervisor on this territory reported that the past winter was the first in the number of years he had been on his division that he experienced no trouble with the tracks at these track pans. The old trouble from heaving of track was practically eliminated and the only extra gang help employed was that incident to the winter maintenance of the division and had no special relation to the track pan installation.

A recent inspection of the installation disclosed, it is said, that the perforated iron drains still perform as efficiently as when first installed and that the discharge of water from the cross drains is practically instantaneous, occurring immediately upon the spilling of the water on the track surface.

Keeping Materials and Supplies in Good Order*

By P. J. McCARTHY
Roadmaster, Kansas City Southern, Shreveport, La.

THE POPULARITY of a railroad in the eyes of the public is gaged very much by the neatness and orderliness maintained by its employees along the line, and especially around the buildings. It falls to the lot of the roadmaster to see that everything is neat and orderly on his district, and he must look to each foreman under his jurisdiction to keep these conditions above reproach. A source of considerable annoyance to the officers of a railroad is the disorderly appearance around many section tool houses, and when such conditions exist it is safe to assume, although it may not always be the case, that the interior of the tool house will present a similar appearance.

Usually a space is allotted near the tool house for the storage of track materials, such as rails, angle bars, switch material, and scrap, and the surroundings will present a much better appearance if these materials are stored in an orderly manner. As well as being a convenience and benefit to the section foreman, it will also be a source of pleasure to the supervisory officers. The roadmaster and section foreman will always know where the material is and can readily check its amount, thus saving time when the material is needed, and aiding materially in complying with the slogan adopted this year by our railroad: "Prevent Waste."

If material is stored in an orderly condition very little space is required on outlying sections. Generally there are very few rails stored at the section tool houses on these sections, but these should be set up on timbers parallel to and well away from the track, placing all good rails of the same lengths and section together, separate from scrap and defective rails. It is always well to mark the lengths on the rails so they can be checked readily when desired. The timber rests may be old ties that have served their usefulness in the track and should be bedded down at regular distances apart and level, as an uneven bedding, even though the rails are piled in regular order, will detract much from an orderly appearance.

Store Material in an Orderly Way

When only a small amount of rail is stored at the tool house, switch points and frogs may be stored on the same timbers. For the storage of angle bars, head rods, connecting rods, tie plates, etc., a platform may be made of old ties, laid close together and these materials piled upon them in regular order. Angle bars, if unbolted, should be piled in tiers of five bars each, each tier resting across the tier below it; if bolted together, three pairs in each tier in the same manner. Bars for each of the different weights and sections of rail and different kinds of bars for the same weight or section of rail should be piled separately. For instance, the common bars and heat treated bars for the 8521 rail and for the 8550 rail should be piled separately, as well as common bars and continuous bars for the 60-lb. rail. Where large numbers of bars are stored they should be piled 50 to 100 bars to the pile and the piles should

*Abstracted from a paper presented at a recent meeting of the Kansas City Southern Maintenance of Way Association, at Texarkana, Tex.

be in double rows with a space between each double row sufficient for easy inspection. All stored angle bars should be oiled frequently.

All new tie plates should be piled upon each other, turning alternate plates over and reversing the direction so that they will not slip on each other and so they can be piled in regular order. Each pile should have an equal number of plates and the piles should be in double rows simlar to piles of angle bars so they can be checked and inspected readily. Second-hand tie plates should be piled in the same manner and separated as between common, old combination and 60-lb. plates.

Head rods, common rods and connecting rods, should be piled separately and apart from the other materials so they can be readily inspected. Heel fillers, guard rail fillers and clamps, as well as rail braces, rail anchors, and other small track material should have similar disposition.

Construct Platforms for Scrap

Foremen who otherwise maintain an orderly appearance around their section tool houses, sadly neglect the disposition of scrap collected on the section. A platform can readily be made alongside the tool house from old ties and bins constructed to separate track and mechanical scrap. When old coal car siding and car sills are available, neater looking platforms can be constructed. These can often be obtained at terminals where cars are rebuilt.

To accentuate the orderliness and neatness at section tool houses, grass and weeds should never be allowed to grow up around the material and the foreman can spend a few minutes with his men at odd times to that end.

At terminals or district headquarters considerable quantities of track material must be stored at all times. Where any quantity of rail is stored the full length rails should be piled in layers, each layer having rails laid crosswise between it and the succeeding layer, and having all ends even. Care should be taken in piling rail to segregate it in classes as new, No. 1 relay, No. 2 relay, No. 1 scrap, and No. 2 scrap. Where uneven lengths of rail of the same class are piled together they should all line up at one end. As each layer is completed the total length of rail in the layer should be measured and recorded and when the pile is completed it should be given a number or letter. To facilitate checking the rail in piles of uneven lengths, I recommend the use of metal tags about 3½ in. by 8 in. on which the lineal feet of rail in a layer can be painted and fastened to the end of a rail in each layer. These tags may be used over and over by giving them a coat of black paint and restenciling when necessary. Frogs, switch points, guard rails, switch stands and smaller track material should be taken care of in the same manner as outlined for outlying sections.

Interior of the Section House

The interior of a section tool house should present as orderly an apearance as the exterior at all times. Racks should be built along the walls for the storge of pick and maul handles. These can usually be stored above the floor where they will be within reach and out of the way. Near the door, and on each side, where they can be easily reached when leaving the tool house, separate racks should be made for shovels, picks, mauls and bars. Lanterns and switch lamps should be hung up and not allowed to lie around on the floor where they will be broken. Scythes and blades, which are used only a short time each season, may be stored overhead on the joists while not in use.

Shelves and bins for the storage of small track material should be built in the rear of the building. Frog and guard rail bolts should be separated as to lengths and placed in separate bins or shelves. Track bolts, spikes, and nut locks may be stored in kegs, but it is also well to have bins for them, as kegs often become broken and the material scattered. We are all confronted with the necessity of conserving material, supplies and tools, and the habit of allowing these things to lie around in disorder must be discontinued. It will require only a few minutes' time, after they are once arranged, to maintain them in a neat and orderly manner, and the roadmaster is going to demand it of his foremen.

Discussion

In the discussion that followed the presentation of this paper, the importance of separating usable material and scrap was stressed. A. N. Reece, chief engineer, stated that ordinarily not enough thought was given to the value of material and that this led to carelessness in the handling of it. About 25 per cent of the material sent to Pittsburgh as scrap is usable material and is recovered by re-sorting. The re-sorting of the material costs money and this expense could be avoided if care were used in loading scrap. The taking in of all usable materials is part of the day's work and should be looked after carefully.

It is sometimes thought that this takes more time than it is worth, but when it is considered that a tie plate is worth 25 cents, the value of material may be appreciated. G. T. Anderson, general roadmaster, in discussing the handling of scrap on the Southern division, said that every car loaded with scrap is stopped at Texarkana and re-sorted to be sure that it contains only the class of scrap called for. Recently a call was made for a car of scrap tie plates, but when the car was examined it included other kinds of scrap as well as serviceable tie plates. The re-sorting of these cars at Texarkana has saved thousands of dollars worth of usable material but entailed an expense which could have been avoided if the proper care had been taken to sort the material before the cars were loaded.

A. R. A. Approves Tie Specifications

THE BOARD of Directors of the American Railway Association has approved the revised specifications for cross-ties and for switch-ties adopted at the last annual convention of the American Railway Engineering Association in March. In a letter announcing this action, under date of July 1, R. H. Aishton, president of the American Railway Association, stated that: "The 1926 tie specifications supersede those heretofore in use. The changes in them from those adopted in 1921 are the result of five years' study and experience. The revised standards which are attached represent the best current practice and it is the belief of the Committee on Ties of the Engineering Division that the inspection of ties in strict accordance with these specifications will bring about distinct improvement in the tie industry. The accompanyng specifications are acceptable to the producers of ties and divergence from them by individual railroads only vitiates the result of co-operative effort through which they were developed."

Canadian National Organizes Fire Fighting Forces

A Total of 1,067 Fires Were Put Out by Company Forces in 1925 While Only 276 Fires Were Caused by Railroad

THE Canadian National Railway System has developed an elaborate and effective organization of its personnel and equipment to protect the Canadian forests from fire. From many standpoints the Canadian National has a vital interest in the protection of the Canadian forests, but looking upon the subject alone from a business point of view, it realizes that as a railway enterprise, the forests represent so much actual and potential traffic, and that as such, the railroad must protect and conserve them to the limit of its ability.

From this point of view alone, the Canadian National system is vitally interested in forest protection and is preaching the need of conservation in season and out of season. Through every possible medium it is constantly urging, not only its own employees, but also the public, to assist in this national work for, as a railway company, its interest in forests is second only to that of the lumber manufacturers and dealers.

Forests a Source of Traffic

It is interesting to note that during the past year more than 9,515,000 tons of forest products were carried on Canadian National lines, and that the forest products used by the Canadian National system during the same period reached a value of $13,859,449. When it is realized that approximately 240,000 cars were required to carry the forest products of Canada during the year, and that 10,000,000 ft. of track would be required to accommodate all of these cars at one time, it is easy to visualize the importance of the forests to the Canadian National. Divided into trains of 50 cars each, it would require 5,000 engines to move these cars, which would stretch two-thirds of the way across the Dominion. The movement of forest products for one year would alone require the service of some 25,000 men, so that it is obvious that not only the company but every one of its employees has a vital interest in this movement to maintain the future tonnage of forest products over their lines.

System Is Highly Organized

Recognizing that this end can be attained only by effective forest protection, which is largely a matter of concerted and organized effort, the Canadian National system has developed a special forest fire department with offices at the system headquarters, and has placed it in the hands of a man whose experience in forestry work has covered a wide field. Two assistants were provided, one in western Canada and one in Ontario. It has also developed a definite system to cope with this prbolem. The important phases of this system include the patrolling of hazardous areas, provision for the systematic reporting of fires, constant inspection of fire-fighting appliances, and the organization of ways and means for combatting outbreaks. Beginning with prevention, which is perhaps the most vital part of the organization work, patrols are made by section forces, augmented by special patrols in forested areas and where special hazards are known to exist.

The patrolling of these areas is done by men on speeders or motor cars and in some cases on foot. The men engaged in this work report any instances where the cleaning up of fire hazards is necessary, or, if possible, remove the hazards themselves. In addition to the patrols there is the constant guard

A Tank Car Train for Fighting Fires in the Forests

by train crews, agents and other operating forces and a continual clean-up drive to eliminate the existence of fire hazards. At the terminals, the constant inspection of locomotives and the testing of spark-arresting devices is carried on with a view to reducing dangers from this source. At the end of every run, locomotives are inspected and in this way the danger from hot cinders is greatly reduced. Improvements to front ends of locomotives are being tried all the time, and applied when such appliances are found suitable. Some of these improvements, which have been instrumental in reducing fire hazards, are the installation of improved ashpans, wider fire grates, and brick arches, all of which have a tendency to reduce dangers from cinders and which break up the particles of live coal which may be ejected.

Yard Engines Equipped with Hose

In the terminals, the installation of fire-fighting appliances and the liberal distribution of hose which may be attached to yard engines, has provided a means of combatting outbreaks. The organization of fire brigades among the company employees, and holding drills twice monthly, with regional and system competitions to develop their efficiency, are also important phases of the system in the checking of outbreaks at shops and terminals where heavy losses might otherwise occur.

While forming the details of the fire-fighting program, the company's equipment was organized on a mobile footing. The yard and switching engines were equipped with a hose pipe connection to the injector which is specially designed for fire-fighting purposes. Nineteen fire-fighting tank cars, carrying from 3,000 to 13,000 gal. of water, were placed at strategic points across the Dominion where fire hazards were greatest. Small packsack hand sprays which carry five gallons of water and can be shouldered by the fire fighters were liberally distributed and have been found efficient in controlling right-of-way burning operations and extinguishing burning logs, ties and telegraph poles. All fire patrols are furnished with grub hoes, axes, shovels and pails, which in some instances are mounted on small motor cars and hand velocipedes. In all forested areas, emergency fire-fighting equipment is carried at the section house where it is always available for immediate use.

For the prevention of fire, the Canadian National has also a system of fire-guarding through forested and prairie areas where fire danger exists. The provision and constant maintenance of over 3,440 miles of fire-guards on the system shows that this feature of the work is not neglected. Along the forested sections, the right-of-way is cleared of brush and slash so that danger from these sources is reduced to a minimum.

Method of Reporting Fires

With the knowledge that the first few minutes of conflagration are the most vital in the fight for its extinction, care has been taken with the fire reporting system, so that knowledge of any outbreak, its extent and the need of forces to combat it, are placed in the hands of the officers directly responsible with a minimum of delay. Special telegraphic forms, carrying this information are provided at all points where they are likely to be required, and by the use of a key system, the employee discovering an outbreak of fire is enabled to place all necessary information in the hands of the proper officers by telegraph and therefore with a minimum loss of time. All such fire reports are given precedence on the wire, and fire-fighting forces can therefore be summoned rapidly to the scene of an outbreak.

Very few other fire reports are required except those devised to record the activities of men solely engaged in fire prevention work and a summary report giving all information pertinent to a fire and the damage incurred. This latter report is one of much importance and is given prompt attention with the view of making an example of every fire and securing data on which to broaden the scope of the company's forest policy.

Organization and Education Bring Results

Publicity is another large and important item in carrying out the Canadian National's fire protection policy. The pages of the company's magazine are open to the forest fire department and a large number of articles have been printed dealing with many phases of fire prevention and forestry life. Forest fire prevention has been given a prominent place on the program of every staff meeting, and special forest protection meetings have been arranged in the principal cities of Canada where government and technically trained foresters have discussed this subject with railroad officers and representatives of every organization connected with forestry work in the Dominion.

Other phases of the publicity given forest protection are the use of the Canadian radio broadcasting stations, posters, slogans, etc. In a little over a year, 250 two-minute talks and 33 addresses on forest fire prevention were given over the 10 Canadian radio stations by prominent men. Almost every pamphlet published by the company has some terse prominent reference to forests and their protection, and "dodgers" issued in co-operation with the Canadian Forestry Association, embodying fire warnings to passengers, are frequently attached to the menu cards in the company's diners.

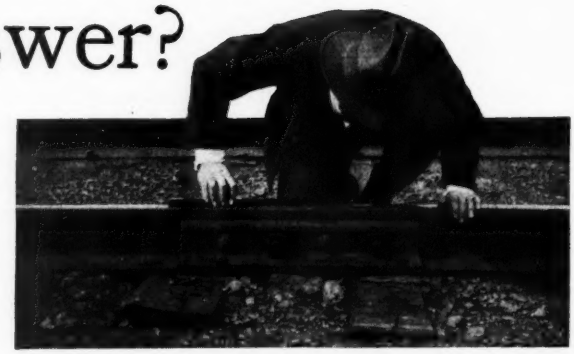
Railway Among the Least Offenders in Causing Fires

Following out these practices the Canadian National has won the confidence and co-operation of the Canadian government officials in its fire prevention work. Not long ago the railways were charged with being the chief cause of forest fires in that country. Today, according to the fire prevention officers of the Board of Railway Commissioners, they are among the least of the offenders. The figures for 1925 show a total of 1,067 fires on Canadian National lines reported and extinguished by the railroad forces, and of these only 276 were reported as attributed to railroad causes. These figures indicate that on a strip of territory 300 ft. wide and some 3,000 miles in length, the railway extinguished 675 fires for which it was in no wise responsible. On the right-of-way itself, 116 fires were reported and extinguished which arose from causes other than the railway. The percentages of causes for the fires reported show locomotives responsible for 39.45 per cent and railway clearing operations 8.35 per cent. The remainder of the list comprises campers, settlers clearing brush, unknown causes and spontaneous combustion.

During 1925 a total of 24,285 acres were burned over with a loss of property of $64,112. A large percentage of this damage occurred in British Columbia, where exceptionally dry weather caused increased fire hazards in the railway territory.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities



QUESTIONS TO BE ANSWERED IN THE OCTOBER ISSUE

1. *What time of year is best for the treatment of soft spots in the roadbed?*

2. *To what extent is the use of treated timber economical for frame buildings for railway purposes?*

3. *In large extra gangs what is the maximum number of men an assistant foreman should be expected to supervise for different kinds of work and different classes of labor?*

4. *What is the best method of applying creosote to horizontal holes bored in treated timber, such as holes for sway brace bolts?*

5. *Where hardwood and soft wood ties are used is it good practice to lay each group out of face by itself on tangent track?*

6. *What type of floor is best for roundhouses sheltering heavy power?*

7. *Do the two engines in a double-header train cause more damage to track than the same engines would in separate trains?*

8. *To what extent is it necessary to maintain heat in pumping stations which are not operated continuously and what type of heating plant is best for this purpose when steam from a nearby source is not available?*

Support for Turntable Circle Rails

Is the use of short ties or wooden blocks advisable in the installation of circle rails for turntables?

Not Recommended for Long Turntables

By I. L. Simmons

Bridge Engineer, Chicago, Rock Island & Pacific, Chicago

I doubt the advisability of using short blocks under the circle rails on the larger tables. Possibly they could be used to advantage under a table 75 ft. or shorter, where lighter engines are being turned, but for longer tables and all tables of the continuous type I do not believe one would be warranted in putting these in on account of the savings shown.

For the continuous type of table it is necessary that the circle rail be level at all times and this cannot be accomplished by using short blocks on which to rest the rail. On the shorter tables of the balanced type, the question of bearing under the end carriage is not of so much importance, as the carriage wheels are not supposed to rest upon the circle rail at any place except where the engine comes on and goes off the table. On the continuous table the wheels should be in contact with the circle rail continuously, and the bearing should be uniform through the entire revolution of the table. Consequently it is of prime importance that the circle rail be put in and maintained at as nearly a perfect level as possible.

Use a Solid Bed of Creosoted Ties Under the Circle Rail

By Engineer of Bridges

I think the best practice consists in using creosoted ties, laid solidly together. The masonry should be wide enough so that the ties will be of such a length as to place the circle rail over the midpoint of the ties. At points where engines go off and on the table, heavy tie plates, 5/8 in. thick, and of ample area, should be used.

About every sixth tie should be made low enough to allow drainage from the space between the rail and parapet wall. The use of a solid bed of ties prevents displacement of the ties, and also gives ample bearing for the circle rail.

Creosoted Ties Embedded in Concrete Are Recommended

By F. H. Cramer

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

The use of short ties in the installation of circle rails for turntables has certain advantages over the practice of placing the rails directly on the concrete or partially embedding them. A good standard practice is to use 8-in. by 8-in. creosoted oak ties with tie plates, bedded into the concrete 6 in. deep. This will allow an opening 1¾ in. to 2 in. between the base of rail and the concrete and of whatever width is allowed between ties, to permit sand, cinders and water to pass through and then down into the pit. The tie is held firmly by the concrete and the regular standard track fastenings can be used to hold the circle rail.

Where the rail is placed directly on the concrete or partially embedded, special fastenings must be used and great care must be taken to place them accurately in position. This type of construction does not allow an opening for water or material such as sand, cinders, etc., to pass through with the results that it all accumulates between the rail and

the face of the circle wall to the height of the top of the rail, causing considerable trouble, especially in the winter time due to ice and snow. Where this condition exists, the rail will heave somewhat during the cold weather, and during the melting and freezing periods the rail becomes very slippery, causing delays in turning. On the wooden tie installation the water passes through the openings freely, and considerable amounts of the sand and cinders are also washed through, keeping the space between the rail and the circle wall well cleaned.

The ties should be well protected with large tie plates as they must withstand a very heavy impact. There will be no difficulty in replacing the ties if they should become badly crushed or decayed.

The Maintenance of Track on Gumbo Embankments

What can be done to improve maintenance conditions on embankments built of gumbo, on which it is difficult to maintain track in either wet or dry seasons?

Blind Drains Will Improve Conditions

By Walt Dennis

Superintendent, New Jersey, Indiana & Illinois, South Bend, Ind.

Embankments composed of gumbo or other impervious materials will in time develop pockets or troughs under the rails, due to the pressures incidental to heavy traffic and the only remedy is drainage or the elimination of these pockets. The methods commonly used are as follows: The digging out of the material under the track and the substitution of a porous material, which is very expensive; the use of drain tile or perforated boiler tubes, which soon become so clogged with dirt as to be useless; and the blasting of the walls of the pocket by small charges of powder in order to break up the material and allow the water to pass through it, which is only a temporary expedient.

A method which has been used successfully is to provide lateral blind drains extending from under the track to the outer edge of the embankment deep enough to drain the water from the bottom of the pockets. The width of the trenches should not be less than two feet and in some cases may be increased to four feet to good advantage. They should be filled with stone of various sizes, ranging from one-man stone as a maximum to four inches as a minimum. The drains should be placed at intervals of 33 ft., discharging alternately to opposite sides of the embankment. Drains constructed in this manner will carry off the water and will serve for a long time without becoming clogged.

Cracks in Gumbo Embankments Cause Trouble in Dry Seasons

By Roadmaster

Most of the troubles on gumbo embankments are due to the fact that this material is very dense and does not allow water to drain through it, hence any depressions in the roadbed are converted into water pockets. The best time to treat this condition is before it starts by using a sufficient depth of ballast to transmit the pressures equally to the underlying roadbed when the track is laid. This, however, is beyond the control of the man in charge of maintenance and he must deal with the situation as he finds it. The drainage of the water pockets is essential and for this purpose lateral blind drains are perhaps the most satisfactory method.

In extremely dry weather longitudinal cracks often develop in the embankment, usually along the toe of the ballast, and sometimes extend for long distances. The ballast sifts into these cracks, with the result that the track becomes low and then goes out of line. This condition may be remedied by watching for the cracks and filling them up as they develop. I have seen such cracks 2 in. wide and over 1,000 ft. long.

Material for Small Under Ground Water Supply Lines

What are the relative merits of cast iron and wrought iron or steel pipe for underground water supply lines less than 4 in. in diameter?

Cast Iron Pipe Is Preferred

By Engineer of Buildings

In my opinion, cast iron will give the best service for underground use. Genuine wrought iron pipe is a close second, nearly equal to cast iron pipe, while I do not believe that wrought steel pipe for underground lines will give the same length of service as either of the other kinds of pipe.

Cast Iron Is Preferred for All Sizes Down to Three-Inch Diameter

By P. L. Battey

President, Battey & Kipp, Inc., Engineers, Chicago

We draw the line at 3 in. on wrought iron or steel pipe and for everything 3 in. and over we use only cast iron. In the smaller sizes we strongly recommend galvanized wrought iron pipe and most frequently, and in nearly every instance, use it on the work we handle.

One thing we are very particular about in the use of wrought iron pipe underground is the protection of the joints. This is the weak spot in the corrosion of wrought iron pipe and it is our practice to coat the joints heavily with red lead and oil and we further wrap the joints with pitched burlap before backfilling. So many underground lines around railroad shops and industrial plants are laid in cinder fills that this is most important, since the corrosive effect of cinders with moisture is severe.

How to Protect Embankments During Times of High Water

What is the most economical method of preventing the erosion of embankments from wave action during times of occasional back water?

Methods Applying to Various Conditions

By W. M. Neptune

Principal Assistant Engineer, Missouri Pacific, St. Louis, Mo.

The question is so broad that a specific answer cannot be given and each individual situation must be studied to develop the economical method of prevention for the particular conditions existing. The method to be employed will be governed by the height of the embankment, the depth of water against the embankment, the distance from rail elevation to maximum water level, the exposure of the situation (meaning whether there are sufficient reaches of open water to develop waves of considerable magnitude or whether intervening bodies of timber will tend to prevent action of magnitude), and the frequency of high-water occurrence. When all these conditions are known, then an economical plan for protection can be outlined. Speaking generally, where the embankments are not high and

the water levels do not raise to an elevation which will often affect the ballast section and when the duration of flood heights is comparatively short, a well graded embankment slope with a good heavy sod will resist ordinary wave attack. In the southern territories Bermuda grass planted on the embankment and cultivated with the view of forming a good sod is probably the best grass.

In cases of sudden overflows resulting from levee breaks and during exceptional storm periods where the embankment is subject to flood water only at rare intervals and for a short period, the sand bagging of the embankment and ballast shoulder is common practice, but is an emergency measure only and is expensive.

On important main lines where high water may be expected every few years, when the height of water closely approximates the sub grade elevation, and open reaches exist, the use of a rock ballast roadway section with rip rap paving on the embankment slope is probably justified. Rip rap paving properly laid up will cost from 12 cents to 17 cents per square foot of surface covered, depending upon local conditions. On important lines where floods are not so frequent as above and of not too long duration, heavy spalled slopes will afford reasonable protection.

In emergencies, almost any available local material can be used, such as wire and brush entanglements, plank fences, log and brush rafts, etc. Such emergency work is usually expensive and is of a temporary nature.

An Economical Method Is to Cover the Slopes with Mine Shale

By G. J. Bell

District Engineer, Atchison, Topeka & Santa Fe, Topeka, Kan.

The most economical method, where the material is available, is to slope the bank and place mine shale, excavating a trench to hold the toe of the material; if mine shale is not available, rip rap and spalls may be used instead. Where back water is frequent and the importance of the line justifies the expense, the bank may be graded to a uniform slope and covered with a concrete blanket, excavating a trench below the scour line to protect the lower part and arranging the top of the blanket so that surface water will not get under it.

Cinder Shoulders for Embankments

Is it practicable and economical to prevent the growth of grass and to improve the drainage of the ballast by lowering the shoulders of embankments by means of a spreader or otherwise and then bringing them up to grade with cinders?

This Method Is Both Practicable and Economical

By G. L. Sitton

Chief Engineer Maintenance of Way and Structures, Southern, Charlotte, N. C.

It is practical and economical to reduce the growth of grass by the application of a layer of cinders between the margin line and the shoulder of the fill. One of the greatest objections to the use of cinders for topping out fills is the fact that when cinders are loaded in coal or ballast cars it is necessary to unload them on the track and shovel them to final location. If all cinders to be used for this purpose could be loaded in dump cars with aprons, it would not only save a great deal of labor, but would obviate the necessity for fouling ballast with cinders. Where dump cars with aprons are not available, cinders should be unloaded just after the track is surfaced and before filling in and dressing up with new ballast. When handled in this way the cinders can generally be placed without the expense of cutting down the roadbed.

I have made no reference in the above to improving the drainage of the ballast, because in dressing our ballast we do not place any around the ends of ties as we expect the water to drain from the bottom of ties and not through the ballast. We do not fill in between double tracks to the top of the ties with ballast, but dress the ballast to the bottom of the tie at the ends and slightly lower than this at the common center line so that the water can drain along the space between the tracks to cross drain pipes which are placed about 500 ft. apart. We realize that this practice does not conform to that in use on practically all other railroads, but we feel that by assuming that the water will drain from the bottom of ties, and by arranging so that it can drain satisfactorily from this elevation we have saved a great deal of money, especially in cleaning ballast and in surfacing as our track and roadbed dries much quicker after a rain.

Practical and Economical in Many Cases

By F. T. Beckett

Engineer Maintenance of Way, Chicago, Rock Island & Pacific, El Reno, Okla.

It is practical in a great many cases and in many territories it is economical. However, in a short time the cinders become foul by sand and refuse drifting in from the adjacent fields, or dropping from cars in transit, and the cinders made from Oklahoma and New Mexico coal will support vegetation. We have a few short stretches of track that have been treated in this way. Care is necessary that too much embankment is not cut off; four to six inches is about right.

Cutting Brush on the Right-of-Way

When is the best time to cut brush on the right-of-way with a view of preventing or retarding its further growth?

Brush in the Southern States Should be Cut About July 1

By J. R. Watt

General Roadmaster, Louisville & Nashville, Louisville, Ky.

In the territory through which the Louisville & Nashville operates, we find that the best time to cut brush on the right-of-way is about July 1, for the hot weather tends to retard further growth.

Varoius Types of Vegetation Require Different Methods

By John Foley

Forester, Pennsylvania System, Philadelphia, Pa.

The best time to cut brush and prevent or retard its further growth varies with the type of vegetation involved. Plants which spread from thin roots (sucker) and those which sprout from their cut stumps (coppice) are most successfully attacked during the period of slowest growth, that is, during the dry spells of the autumn. Plants which depend entirely on seeds for their reproduction may be eliminated if they are cut just before their seeds ripen. Plants which persistently reproduce from either or both seed and stump require a pre-seeding cutting and another cutting when growing conditions are least favorable.

Burning is an effective way to destroy plant life, and where hot surface fires can be handled safely they obliterate vegetation by the damage done to both the

roots and tops and the seed by the flames and heat. Grazing is a sure way to eliminate plants; but railroad right-of-way is not suitable as a range for ruminants. Grubbing may be necessary for tenacious plants where burning and grazing are impracticable, and where cutting is ineffective.

Brush in Northern Latitudes Should be Cut in August

By J. F. Peterman

Yard Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Superior, Wis.

My experience has been that, in the northern states, August is the best time to cut brush, as the sap is at its highest point at that time of the year, and if the brush is cut and burned at that time very little of it will grow the next year. I believe that cutting brush in the northern states during the spring, fall or winter is a waste of time.

Pumps for Cofferdams

What is the best type of pump for foundation cofferdams or open caissons? If centrifugal pumps are used which are preferable, direct-connected or belt-driven units?

The Type Selected Will Depend on a Number of Conditions

By George E. Tebbetts

Structural Engineer, Chicago Rapid Transit Lines, Chicago

In selecting a pump for foundation work, consideration must be given not only to the required capacity of the pump but also to the conditions which affect the water to be pumped. For large cofferdams and caissons the centrifugal pump has many advantages since it is handled easily and will function satisfactorily with water containing sand or mud. The vertical belt-driven type is preferred, so arranged that the shaft may be readily extended and the pulley shifted as the pump must be lowered. Where current is available an electric motor is the best form of power, but ordinarily a steam engine must be used. Both the noise and steam exhaust from a direct connected pump are objectionable in a cofferdam, while the vibration of a unit of this type requires that a substantial support be provided.

For small quantities of water some type of steam siphon or ejector does very well since there are no moving parts to be clogged by sand or other gritty material and the installation is extremely simple. Where the water is clear a pump of the so-called valveless type can often be used to good advantage.

Belt Driven Centrifugal Pumps Are Preferred in Most Cases

By Superintendent of Construction

The choice of pumps will usually depend on the amount of water to be handled, but it is always well not to figure too closely in this respect since it is desirable to have some reserve capacity for emergencies. Where only small amounts of water are encountered some form of steam siphon is very satisfactory due to the ease with which it may be handled, although it is apt to be somewhat wasteful of steam. For larger quantities of water my personal preference is usually for a vertical centrifugal pump with an extensible shaft and an adjustable pulley for belt drive, as such a unit takes up little room, is easily installed and avoids the annoyances incidental to extending the suction pipe as the excavation progresses. When all conditions are favorable the direct connected centrifugal pump will give good results, but it is often difficult to provide a rigid support for it and in such cases the vibration of the engine running full load is apt to cause trouble.

Concrete Curb for Station Platforms

What are the relative merits of pre-cast concrete curb and curb built in place for station platforms?

Each Type Has Advantages Under Certain Conditions

By Frank R. Judd

Engineer of Buildings, Illinois Central, Chicago

A pre-cast curb is recommended at points where it is not feasible to build the curb in place on account of local conditions, or at small stations where no other concrete work is being done, thus saving the transportation of the required materials and equipment to cast the curb in place. The cost of the two types is practically the same. Curb cast in place makes a better job in that it retains its lines due to filling up the excavated trench.

Pre-Cast Curb Is Economical for Small Installations

By Supervisor of Buildings

For large platforms requiring a considerable length of curb the practice of building the curb in place is usually the most satisfactory since better line and surface can usually be maintained with this type, while there is little difference in first cost under such conditions. For small platforms, especially if the work is to be of a more or less temporary character, the use of pre-cast curb will be more economical. If the season's requirements can be anticipated pre-cast curb can be made very cheaply at a central point.

Adjusting Spirals to Speed

Spiral curves are preferably of such length as to coincide with the run-off for the superelevation of the curve. If for any reason a material change is made in the superelevation of the curve should the spirals be changed where the speeds do not exceed 55 or 60 miles per hour?

A Further Answer to a Previous Question

By E. F. Robinson

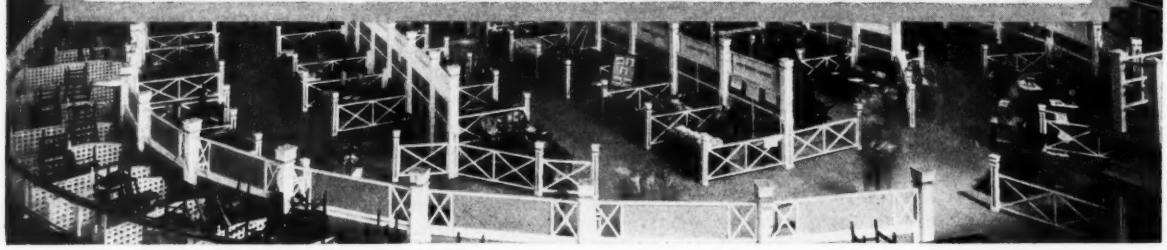
Chief Engineer, Buffalo, Rochester & Pittsburgh, Rochester, N. Y.

The length of spiral easement should be proportional to the superelevation carried in the main part of the curve. Correct practice requires that the length of the easement should be increased as the speed increases. Therefore, any material change in the superelevation in the main part of the curve requires that the length of the easement be changed accordingly, even though speeds do not exceed 55 or 60 miles per hour.

Freight Movement Faster—The daily average movement of freight cars in May was the highest for any May on record, amounting to 29.8 miles per day, according to reports compiled by the Bureau of Railway Economics. This was an increase of 1.2 miles over the average for the best previous May, which was in 1923, and an increase of 2.5 miles over that of May last year. The average load per car in May was 26.8 tons, the same as that for May last year but four-tenths of a ton above that of May, 1924.

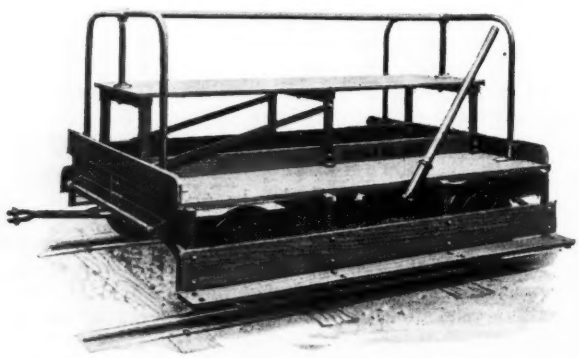
Getting the Manufacturers' Help

Current Developments in New and Improved Labor Saving Appliances



A New Buda Motor Car Trailer with Removable Superstructure

THE BUDA Company, Chicago, has placed on the market a motor car trailer with a complete steel substructure, which can be used for the transportation of extra gangs or bridge gangs to and from their work and which, by the removal of the seats,



The Buda No. 193 Steel Frame Motor Car Trailer With Removable Superstructure

safety railing and footboards, may be converted into a platform car for hauling heavy materials, thus making it a general purpose car. This trailer, designated as No. 193, will carry 20 men and has a weight-carrying capacity of 10 tons. The seats and other parts of the superstructure above the floor of the car, as well as the footboard, may be removed and replaced quickly and easily. Brakes are supplied, actuated by a hand lever which will apply the brakes to all four wheels by movement in either direction and coupler plates are provided at both ends of the car. A single drawbar and coupling pin are furnished with each car. The car may be ordered with or without brake or footboards as desired. The steel sub-frame has hard maple cross sills, decked with selected yellow pine boards, while the superstructure is rigidly supported and braced by steel straps.

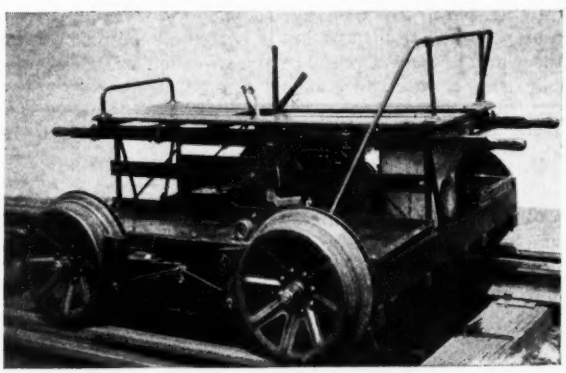
The car body has an overall length of 7 ft. 4 in. and an overall width of 6 ft. 8½ in. The platform with the superstructure removed is 83 in. long by 66¾ in. wide and the seat is 83 in. long by 26½ in. wide with a tool space 81½ in. by 22½ in. underneath. Buda rolled steel insulated wheels, 16 in. in diameter, with double reinforced treads, M. C. B. flanges and hot riveted hubs, are used on 1½ in. open hearth steel axles, running on roller bearings. The wheel base is 43¼ in. and the weight of the car is 825 lb.

These trailers have demonstrated marked economies on a number of roads on which they are in use due to the fact that they can be kept in constant service and that by their use the necessity of a work train can often be avoided.

A New Center-Load Inspection Motor Car

MUDGE & CO., Chicago, have brought out a new center-load inspection motor car which is known as the Mudge Class B-2 "Inspector." While the car can be handled easily by one man it has ample seating capacity for four men and is designed to be capable of long continuous inspection trips.

The car is equipped with a 4-hp., free-running motor, the parts of which are interchangeable with the parts of the motor used in the new Mudge Class 1-A light section motor car. Transmission is accomplished by a multiple disc clutch which transmits the power to a sprocket on the rear wheel by a roller



The Mudge Class B-2 "Inspector"

chain. The motor is water-cooled with the Mudge thermo-syphonic design of water hopper, which is claimed to permit three times the ordinary cruising radius without excessive heating of the engine. The

crank shaft of the engine is mounted on roller bearings. A starting crank is provided to avoid the inconvenience of starting the car by pushing it.

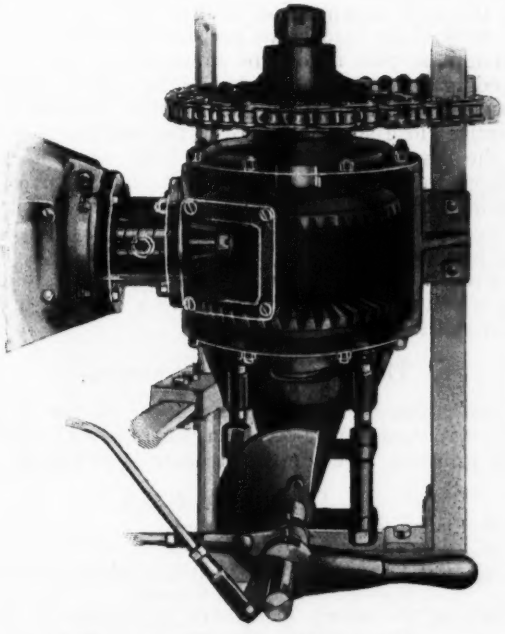
The brakes are self adjusting and act on all four wheels, thus avoiding adjustment for wear, since the braking power is always equal on all the wheels. A locking device is also provided so that when the brakes are set they hold the car until released by the operator, eliminating the necessity of blocking the car when it is standing alone on the track.

The frame of the car is made of kiln-dried maple and is provided with metal plates built into the lower part to act as skids, facilitating the removal of the car from the rails and protecting it from injury at such times. The wheels are of pressed steel, 16 in. in diameter, with M. C. B. standard flanges. The axles are made of cold-drawn steel running in roller bearings which take both radial and thrust loads.

The car weighs 490 lb. and the lifting weight is 140 lb., the light lifting weight being due to the distribution of weight and the use of extension lifting handles which are provided at both ends of the car.

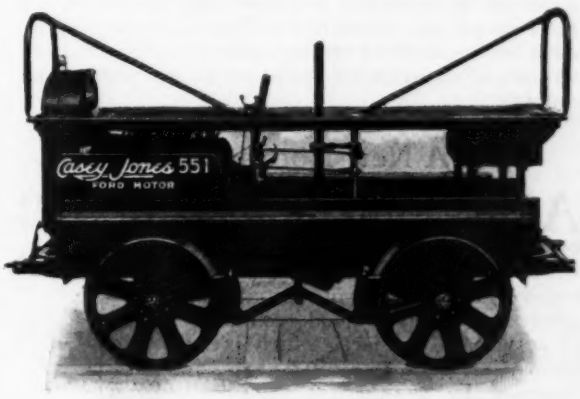
A Motor Car with a Novel Design of Transmission

THE Northwestern Motor Company, manufacturer of Casey Jones motor cars, has recently completed exhaustive tests on a new motor car, the Casey Jones 551. The car is designed for heavy duty service such as weed discing, weed mowing and the hauling of large extra gangs as well as for all purposes where a large and high powered car is required.



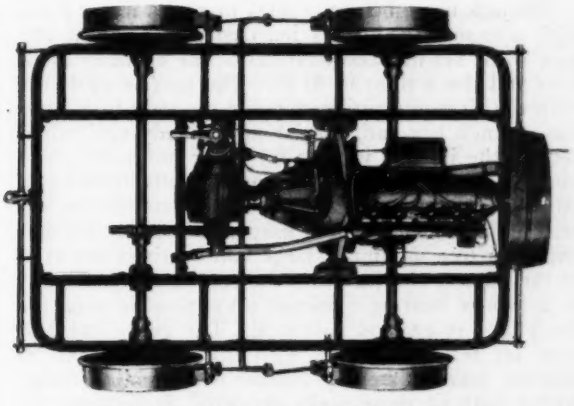
A Phantom View of the Transmission

The car is equipped with a standard Ford motor and a special Casey Jones automotive gear transmission designed to utilize to full advantage the 20 hp. of the Ford motor. The transmission is of novel design, consisting of two Ford ring gears which can be used alternately on the Ford engine pinion so as to give two equal speeds in either direction by shifting from one position to the other by means of a shifting lever which is located conveniently on the seat. The Ford clutch is used by attaching the lever to the low pedal so that the car is started by engaging the low gear of the motor. Then after the car is in motion the clutch lever is dropped back into high, giving direct drive from the engine. The transmission is entirely enclosed, the gears and end thrust ball bearings running in grease. The gears are also held in mesh in either position by a positive lock of eccentric type which also determines the mesh of the gears automatically.



A Side View of the Casey Jones 551 Car

One particular feature of this transmission is the fact that it cannot be shifted to clash the gears because the drive pinion is stopped from rotating automatically at the same time as the Ford clutch is thrown into neutral. Consequently there is no motion to contend with during this operation.



A Plan View with the Body Removed

The power from the transmission is transmitted to the rear axle by means of a roller chain of ample size, running on two hardened steel sprockets with a drive chain take-up adjustment on the axle.

The Northwestern Motor Company has made extended use of the Ford motor. It was formerly used on the Casey Jones 550, a friction driven car, but extended tests have proved that this new transmission is much more efficient and doubles the tractive effort that is available for starting heavy loads, bringing it to approximately 350 lb.

In a recent test covering 500 miles of actual operation on the Chicago, Rock Island & Pacific, the car readily handled two five-unit discing machines cut-

ting into the ballast to a depth of five inches without placing an excessive load on the car. Experience with weed mowers is said to have been equally successful.

The Casey Jones 551 is provided with full safety equipment, adjustable clamp type thrust collars on the axles, Hyatt roller bearings and an all-steel frame. Standard Ford starting and lighting equipment can be furnished if desired and the use of the Ford motor and standard Ford parts permits immediate service at Ford service stations and insures the services of experienced operators in any part of the country.

A New Norton Jack

A NEW jack, designed primarily for bridge work but which is also adapted to general use, has been placed on the market by A. O. Norton, Inc., Boston, Mass., and is used extensively on a number of railroads where it has given good results in service. This jack, which is known as style No. 912, was designed by a practical bridge man with a view of obtaining a compact tool having ample strength for its requirements and which at the same time should be of such size and weight as to be handled easily by one man in confined spaces. The dimensions of the jack and the height of lift were determined after a thorough checking of the specifications of a number of the leading railroads to render it especially useful in changing stringers in timber trestle bridges.

The Norton No. 912 Jack

The jack has a height of 14¾ in. and a lift of 9 in., with a base 6 in. by 7½ in., designed to allow the jack to be set in close quarters. The capacity is 12 tons and the weight is 40 lb. The jack is equipped with the Norton positive stop and the steel jack lever has a pinch bar end, furnishing a handy tool when setting the jack as well as for other purposes. The housing of the jack is rugged and heavily ribbed and all of the materials entering into its construction are selected to withstand hard usage. To reduce friction and wear to a minimum, large ball bearings are used at the base of the jack and the stem gear shaft runs in a bronze bearing. Special alloy steel is used for the gears, screw and ball race. The gears and ball race are interchangeable with those of the No. 50 Norton journal jack, a feature which is of value where both of these jacks are used, facilitating repairs in emergencies and reducing the stock of repair parts to be carried.

Concrete Pavement in a Team Yard of the Southern at Cincinnati

With the Associations

American Railway Engineering Association

Honorary membership has been conferred on L. C. Fritch, vice-president-operation, Chicago, Rock Island & Pacific, by recent action of the Board of Direction. This honor, which has been awarded to only three men previously, was conferred on Mr. Fritch "in recognition of the invaluable services he rendered the association during its formative stage and for his acknowledged eminence in railroad engineering and management." Mr. Fritch assumed a leading part in the organization of the A. R. E. A., participating in a preliminary conference with 16 other railway officers at the Auditorium Hotel, Chicago, on October 21, 1898, out of which grew the present organization. He was elected secretary of the tentative organization at that time and early in the work of the association prepared a comprehensive and unique plan or outline of work for each of 14 standing committees, which plan has been followed closely since that time. Mr. Fritch continued to exercise close supervision over the secretarial work of the association until March, 1903, when he was obliged to relinquish active duties on account of ill health. He continued his duties in an advisory capacity, however, until elected a director in 1907. He was elected second vice-president in 1908, first vice-president in 1909 and president in 1910, following which he continued to serve as a member of the Board of Direction until 1915.

The Roadmasters' Association

The program for the convention of the Roadmasters' Association is being completed rapidly. The program as completed to date is as follows:

Tuesday, Sept. 21

10:00 a. m.	Convention called to order.
10:10 a. m.	Opening address.
10:30 a. m.	Address by R. H. Aishton, president, American Railway Association, Chicago.
11:00 a. m.	President's address—G. W. Morrow. Report of Secretary and Treasurer. Appointment of Special Committees.
11:30 a. m.	Report of Committee on the Repair of Track Tools, B. C. Dougherty, chairman, roadmaster, Chicago, Milwaukee & St. Paul, Chicago.
12:30 p. m.	Adjournment.
2:00 p. m.	Address on Safety in the Maintenance of Way Department, by Thomas H. Carrow, supervisor of safety, Pennsylvania Railroad, and chairman, Safety Section, American Railway Association, Philadelphia, Pa.
3:00 p. m.	Report of Committee on The Construction and Maintenance of Highway Crossings and Their Approaches (including signs), to Promote Safety, A. E. Preble, chairman, supervisor, Pennsylvania, Middletown, Pa.

3:30 p. m. Paper on The Effect of Modern Locomotives on the Length of Turnouts, by H. J. Pfeiffer, chief engineer, Terminal Railroad Association of St. Louis, St. Louis, Mo.

4:00 p. m. Adjournment to visit exhibit Track Supply Association.

8:00 p. m. Special program.

Wednesday, Sept. 22

9:30 a. m. Report of Committee on Track Joints and Their Maintenance, C. W. Baldridge, chairman, assistant engineer, Atchison, Topeka & Santa Fe, Chicago.

10:30 a. m. Address on Care and Selection of Cross Ties, by John Foley, forester, Pennsylvania, Philadelphia, Pa.

11:30 a. m. Address by C. A. Morse, chief engineer, Chicago, Rock Island & Pacific, Chicago.

12:30 p. m. Adjournment.

2:00 p. m. Report of Committee on the Rearrangement of Track Work to Promote Uniform Forces Throughout the Year, J. Clark, chairman, supervisor, Baltimore & Ohio, Walkerton, Ind.

4:30 p. m. Adjourn to visit exhibit Track Supply Association.

6:30 p. m. Annual dinner of the Track Supply Association and the Roadmasters' Association.

Thursday, Sept. 23

9:30 a. m. Report of Committee on The Collection and Use of Cost Data by Supervising Forces, E. P. Hawkins, chairman, division engineer, Missouri Pacific, Osamatomie, Kan.

11:00 a. m. Business session.
Election of officers.
Selection of meeting place.

1:30 p. m. Adjournment.

2:00 p. m. Trip by special train over the Illinois Central's terminal improvement and electrification work to Markham Yard where an opportunity will be afforded to study the construction and maintenance of Chicago's newest large classification yard and to witness the operation of two types of car retarders.

The Track Supply Association

A total of 55 manufacturers of track materials have already taken membership in the Track Supply Association to date, including 49 exhibiting and 6 non-exhibiting members. This includes the following firms in addition to those whose names were published in the July issue.

American Fork & Hoe Company
Edison, Thomas A., Inc.
Electric Tamper & Equipment Company
Kentucky Rock Asphalt Company
Magor Car Corporation
Racine Tool Company
Railway Review
Wharton Jr. & Co., Inc., Wm.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 12-14, 1926, Richmond, Va.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Congress Hotel, Chicago, March 8-10, 1927.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 26-28, 1927, Nashville, Tenn.

Bridge Building Supply Men's Association.—B. J. Wilson, secretary, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention January 28-29, 1927, Nashville, Tenn.

National Railway Appliances Association.—C. W. Kelly, secretary, Seeberger Building, 845 South Wabash avenue, Chicago. Annual exhibition March 7-10 during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 21-23, 1926, Chicago.

Track Supply Association.—W. C. Kidd, secretary, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

LAST MONTH'S Material Market column reported the announcement by certain manufacturers of an increase of $2 per ton in the prices of steel bars and structural shapes applicable to orders placed in the third quarter of 1926. However, some doubt was expressed as to the effectiveness of this advance, and subsequent events have indicated that there were adequate grounds for questioning the practicability of such an increase in prices. In fact, the prices of structural steel show marked evidence of softening at both Chicago and Pittsburgh, and the same holds true of track spikes and track bolts which are quoted at 10 cents less than last month. Cast iron pipe is also quoted at a moderate reduction from the previous figures.

PRICES PER 100 LBS.

	June		July	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	.....	$2.90 to $3.00	.....	$2.80 ..... $2.90
Track bolts	.....	3.90 to 4.00	$3.90 to 4.15	..... 3.90
Angle bars	$2.75	2.75	2.75	2.75 2.75
Tie plates, steel	2.35	2.35	2.25 to 2.35	$2.25 to 2.35
Boat spikes	3.25	3.25	3.25	3.25 3.25
Plain wire	2.50	2.55	2.50	2.55 2.55
Wire nails, keg	2.65	2.70	2.65	2.70 2.70
Barb wire, galv.	3.35	3.40	3.35	3.40 3.40
C. I. pipe, 6 in. 12 in., ton	.....	49.20 to 49.70	.....	..... 48.20 to 49.20
Plates	1.90	2.10 to 2.20	1.90	..... 2.10
Shapes	$1.90 to 2.00	2.10 to 2.20	.....	2.00 ..... 2.10
Bars, soft steel	2.00 to 2.10	2.10 to 2.20	.....	2.00 ..... 2.10
Rivets, struct.	2.50 to 2.60	2.75	2.50 to 2.60	..... 2.75
Conc. bars, billet	2.00 to 2.10	.....	2.00 to 2.10	....
Conc. bars, rail	1.80 to 1.90	2.00	1.80 to 1.90	..... 2.00
Rail, per gross ton, f.o.b., mills	.....	43.00	.....	..... 43.00

During the past month the scrap market has taken a definite upward trend, and the prices quoted below are considerably above those of the previous month. However, not a great deal of scrap is moving at the new prices.

PER GROSS TON

	June	July
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	15.00 " 15.50	17.25 " 17.75
Rails less than 3 ft. long	16.50 " 17.00	17.50 " 18.00
Frogs and switches cut apart	13.50 " 14.00	16.00 " 16.50
Steel angle bars	14.50 " 15.00	16.50 " 17.00

A comparison of the statistics for production, sales, shipments and accumulated stock of the southern pine and west coast lumber manufacturers covering the last four years indicates that relationships have not changed appreciably during all of that time, barring, of course, the normal seasonal variations. A moderate increase in demand during recent weeks has tended to cause some marking up in prices, but this tendency has been irregular and is not of a character which could be taken as evidence of a general trend.

SOUTHERN PINE MILL PRICES

	June	July
Flooring, 1x4, B and B flat	$46.37	$45.68
Boards, 1x8, No. 1	35.35	37.90
Dimension, 2x4, 16, No. 1, common	27.41	29.42
Dimension, 2x10, No. 1, common	30.56	29.07
Timbers, 4x4, to 8x8, No. 1	28.05	28.28
Timbers, 3x12 to 12x12, rough	39.46	45.40

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear, flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 3x12 to 12x12, rough	18.00	18.00

Portland cement prices indicate their characteristic stability and the table of prices given below embodies no change from that given in last month's issue. The prices are per barrel for carload lots, not including package.

New York	$2.15	Minneapolis	$2.32
Pittsburgh	2.09	Denver	2.85
New Orleans	2.30	Dallas	2.05
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.15

Railway News Briefly Told

Railway freight traffic for the first five months of 1926 amounted to 187,869,465,000 net ton-miles, exceeding by 0.2 per cent the previous record for net ton-miles established in the corresponding period of 1923 and by 6.4 per cent the figures for the corresponding period of last year. Previous records for the month of May also were broken with a total of 39,831,820,000 net ton-miles, an increase of 0.6 per cent over the total for May, 1923.

An order for German-made rails for the Argentine State Railways has been cancelled, according to Ambassador Jay at Buenos Aires, due to the fact that the rails were found to be too brittle. The manufacturers, Fried Krupp, represented by Staudt & Co., asked for a reconsideration and substitution of the personal guarantee by a deposit of $200,000 in bonds, but the board of directors of the railway voted unanimously in the negative on both proposals.

Revenue freight car loadings in the week ended July 10 amounted to 900,977, a decrease of 85,916 cars as compared with the corresponding week of 1925 and of 9,006 as compared with 1924. However, the fact that the holiday on July 5 of this year came in this week destroys the effect of the comparison. The cumulative total for the first 28 weeks of this year amounts to 27,010,065, compared with 26,181,582 and 24,853,039 for the corresponding periods in 1925 and 1924, respectively.

A practical test of the plan advanced by Frank H. Alfred, president of the Pere Marquette, for a new form of track construction, will be carried out on the Pere Marquette between Detroit, Mich., and Plymouth. This form of construction, which was described in *Railway Engineering and Maintenance* of January, 1926, comprises the use of a reinforced concrete slab approximately 16 ft. wide and 18 in. thick, to which the rails are attached without the interposition of track ties.

The Chicago, Milwaukee & St. Paul will erect a string of radio stations between Chicago and the Pacific coast to be used exclusively by the carrier for communication between points on the road. Stations will be established at Chicago, Milwaukee, Wis., Minneapolis, Minn., Omaha, Neb., Kansas City, Mo., Miles City, Mont., Butte, Spokane, Wash., and Seattle, giving the company direct radio communication over 11,000 miles of lines. The equipment to be used will be of the short wave type. Experiments already conducted have shown that stations are able to communicate at a distance of 1,300 miles under adverse conditions.

A practical demonstration of radio telephone communication between the engineman in the locomotive cab and the conductor in the caboose of a 115-car freight train was conducted on the New York Central on July 8, between Chicago and Elkhart, a distance of 95 miles. The train consisted of 62 loaded and 51 empty cars, the majority of which were steel hopper cars, 1 business car, 1 coach and 1 caboose. The radio apparatus performed in a satisfactory manner throughout the run, although the speech transmission or reception was considerably reduced when the engine or caboose was passing through a long steel bridge.

The Canadian Pacific is operating two hospital cars along its Laurentians run between Montreal, Que., and Mont Laurier in order to meet any demands that may arise or urgent calls that may occur in cases of sickness or accidents on the line. First-class cars have been converted into hospital rooms in such a way as to easily take care of four or five sick or injured persons. These cars are attached to the baggage car at the front of the train, and are entered through the baggage car so that stretcher cases are ensured privacy and can be easily handled. This accommodation is given on two trains every day of the week, and one train on Sundays.

The Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific are now being operated as the Vicksburg Route division of the Yazoo & Mississippi Valley, the lessee of those two railroads. Division headquarters are at Vicksburg, Miss. The present Vicksburg division of the Yazoo & Mississippi Valley is designated as the Greenville division, headquarters remaining at Greenville, Miss. The division headquarters of the New Orleans division have been moved from Vicksburg, Miss., to Baton Rouge, La. Vicksburg yard (Y. & M. V., A. & V. and V. S. & P.), including shops, are under the jurisdiction of the superintendent of the Vicksburg Route division.

A fire on the high bridge of the Baltimore & Ohio, across the Susquehanna river at Havre de Grace, Md., on the morning of June 22, destroyed about 500 ties, together with the platform between the tracks for the whole length of the eastern span, necessitating the diversion of trains to the Pennsylvania, between Perryville and Baltimore, for three hours, from 1 a. m. to 4 a. m. The floor of the bridge is about 90 ft. above the river and the Havre de Grace fire department had difficulty in raising water to that height. The ties, which were creosoted, were nearly new. The fire is supposed to have started from coals from a locomotive fire box.

Of the casualties to railroad employees in the United States in 1925—1,599 killed and 119,224 injured—no less than 76 of the fatal and 589 of the non-fatal injuries were incurred by men not on duty, according to Circular No. 131 which has been issued by the Committee on Education of the Safety Section, A. R. A. One of the most common causes of injury to men off duty is the practice of riding on the side of a freight train to save a short walk and the circular emphasizes the fact that many of these employees are not in the train service and have no more excuse for endangering their lives than would a school teacher or a clergyman.

The new Board of Mediation created by the railway labor act held a meeting in Washington on July 9 and elected Samuel E. Winslow, former chairman of the House committee on interstate and foreign commerce, as its chairman. Mr. Winslow was appointed for a five-year term, while the terms of the others expire in from one to four years. The board held an informal discussion of its duties under the law and appointed subcommittees to consider the selection of offices for the board and the disposition of the files of the old Railroad Labor Board. John J. Marrinan, who has been personal secretary to Secretary Hoover of the Department of Commerce, has been appointed secretary of the board.

A study just completed by the Bureau of Railway Economics discloses the fact that the total cost of freight transportation on the New York State Barge Canal is more than twice that by rail. The cost of the canal was provided for by an issue of bonds by the state of New York, which also maintains the canal, permitting the operation of boats free of toll. In computing the total cost of transportation by the canal it is necessary to include not only the operating charges of the boats but also the interest on the investment as well as the annual cost of maintenance, repairs and depreciation. On this basis the cost of transportation per ton-mile on the canal in 1925 was 2.533 cents while the total cost by rail was 1.108 cents.

Personal Mention

General

C. W. Lentz, roadmaster on the Indiana division of the Illinois Central, with headquarters at Mattoon, Ill., has been promoted to trainmaster on the same division, with headquarters at Palestine, Ill.

A. R. Raymer, chief engineer of the Pittsburgh & Lake Erie and the Lake Erie & Eastern lines of the New York Central, with headquarters at Pittsburgh, Pa., has also been appointed assistant vice-president of these roads, continuing his duties as chief engineer. Mr. Raymer was born on December 1, 1862, in Canada, and was educated at Toronto University, Toronto, Ontario. He entered railway service in 1884 on a road which is now a part of the Canadian National. From 1886 to 1888 he was on location and construction with the International Railway of Maine (now a part of the Canadian Pacific) and in 1889 he was employed on location on a part of the Canadian National. From 1889 to 1891, he was on the Cumberland Valley extension of the Louisville & Nashville, becoming associated with the Lake Shore & Michigan Southern (now a part of the New York Central) in the latter year, where he remained until 1896, when he entered the service of the Pittsburgh & Lake Erie as assistant chief engineer, with which road he has been continuously since that time. He was promoted to chief engineer in 1920.

A. R. Raymer

W. B. Wood, who was furloughed while general superintendent of the New Jersey division of the Pennsylvania on account of injuries received in an automobile accident last September, and who was formerly connected with the engineering department of the same road, has recovered sufficiently to resume duty and has been promoted to assistant to the general manager of the Western region, with headquarters at Chicago, succeeding **J. B. Hutchinson, Jr.,** transferred. Mr. Wood was born on September 11, 1876, at Harrisburg, Pa., and graduated from Sheffield Scientific School at New Haven, Conn., in 1897. He entered railway service on October 6 of the same year as a rodman on the Pittsburgh, Cincinnati, Chicago & St. Louis (now a part of the Pennsylvania) and was promoted to levelman in November, 1897, serving in that capacity until September 1, 1899, when he became assistant engineer on the Cleveland and Pittsburgh division of the Pennsylvania, where he remained until January 1, 1901, when he was made division engineer on the Cincinnati & Muskingum (now a part of the Pennsylvania). He became division engineer of the Cleveland and Pittsburgh division of the Pennsylvania on June 7, 1901, and was promoted to superintendent of the Richmond division of the Pittsburgh, Cincinnati, Chicago & St. Louis on July 1, 1903. From that date to April 1, 1914, he was superintendent on various divisions and subsidiaries of the Pennsylvania, when he was promoted to general manager of the Grand Rapids & Indiana (now a part of the Pennsylvania), serving in this capacity until March 1, 1920, when the lines comprising the Pennsylvania System were divided into four operating regions. Following this reorganization he became general superintendent of the Illinois division, with headquarters at Chicago, and was transferred to the New Jersey division in 1923, with headquarters in New York, in which capacity he was serving when he received the injuries which necessitated his furlough.

Engineering

Frank Manning, resident engineer on the Pere Marquette, who has been in charge of the construction of a new yard at Oak, Mich., has been transferred to Flint, Mich., in the same capacity.

A. J. Wagar has resigned as chemist and engineer of tests on the Louisville & Nashville to become engineer of tests on the Chesapeake & Ohio, with headquarters at Richmond, Va., succeeding **J. J. Ewings,** deceased.

F. P. Wentz, assistant engineer in the valuation department of the Oregon-Washington Railroad & Navigation, with headquarters at Portland, Ore., has been promoted to valuation engineer, with the same headquarters, succeeding **W. C. Smock,** resigned.

Robert Trimble, assistant chief engineer of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been appointed chief engineer of the Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago & St. Louis (Panhandle), with the same headquarters.

L. E. Willis, roadmaster on the Missouri-Kansas-Texas, with headquarters at Denison, Tex., has been promoted to office engineer, with headquarters at Dallas, Tex., succeeding **W. C. Brown,** who has been appointed assistant engineer, with the same headquarters.

E. J. Henriques, office engineer of the Mobile & Ohio, with headquarters at St. Louis, Mo., has been promoted to engineer of construction in charge of grade reduction on the St. Louis division, with temporary headquarters at Ava, Ill. **C. W. Rice,** of the engineering department, has been promoted to acting office engineer to succeed Mr. Henriques.

Thomas J. Skillman, assistant chief engineer of the Western region of the Pennsylvania, with headquarters at Chicago, has been appointed chief engineer of the Long Island, a subsidiary of the Pennsylvania, succeeding **L. V. Morris,** who has been appointed consulting engineer. A sketch of Mr. Skillman appeared in the May issue of *Railway Engineering and Maintenance.*

C. T. Lyon, assistant engineer of construction on the New York, New Haven & Hartford, with headquarters at New Haven, Conn., has been promoted to engineer of construction, with the same headquarters, to succeed **A. L. Curtis,** who has resigned to enter private business. **A. C. E. Mullen,** assistant engineer of construction, with headquarters at New York, has been promoted to engineer of construction, with the same headquarters. **H. E. Brink,** assistant engineer of construction, with headquarters at New Haven, has been promoted to general assistant engineer, with the same headquarters.

Charles D. Prentice, whose promotion to assistant engineer of the New York, New Haven & Hartford, with headquarters at Waterbury, Conn., was announced in the June issue, was born on August 4, 1893, in New York City. He received his college education at the Sheffield Scientific School of Yale University. Mr. Prentice entered railway service on July 5, 1913, with the New York, New Haven & Hartford. He served as chainman, inspector and transitman successively on the New Haven, with headquarters at New London, Conn., from July, 1916, to September, 1917, when he was appointed draftsman, which position he held until July, 1920, when he was appointed transitman at Danbury, Conn. In September, 1923, he was appointed cost engineer, which position he held until February, 1926, when he was promoted to his present position.

W. G. Morgan, division engineer on the Kansas City Southern, with headquarters at Kansas City, Mo., has been transferred to Texarkana, Tex., as chief engineer of the Texarkana & Ft. Smith, and division engineer of the Kansas City Southern, with jurisdiction over both the roadway and engineering departments, the office of general roadmaster

having been abolished. **T. F. Quinn,** who has heretofore been chief engineer of the Texarkana & Ft. Smith and assistant engineer on the Kansas City Southern, will assume the title of assistant engineer on both lines, with headquarters at Texarkana, Tex. **I. L. Hartzell** has been appointed acting division engineer, with headquarters at Kansas City, to succeed Mr. Morgan. **P. J. McCarthy,** district roadmaster, with headquarters at Shreveport, La., has been appointed assistant engineer, with headquarters at Kansas City, Mo.

C. H. Paris, whose appointment as chief engineer of the Chicago & Illinois Midland, with headquarters at Springfield, Ill., was reported in the June issue of *Railway Engineering and Maintenance,* was born on April 19, 1882, at Winona, Minn., and graduated from the engineering schools of the University of Minnesota and the University of Wisconsin. He entered railway service in September, 1905, as an axeman on the location of new main lines of the Northern Pacific, later serving as a rodman on heavy main line construction. He entered the service of the Chicago & North Western in April, 1909, in the construction department, being transferred to the maintenance department in the same year as instrumentman at Chicago. Mr. Paris was promoted to assistant engineer of the Dakota division in 1913, and was transferred to the valuation department in 1916. In February, 1917, he was promoted to assistant engineer of maintenance of the Dakota division and was transferred to the Minnesota division in July, 1919. He continued there until his recent appointment as chief engineer of the Chicago & Illinois Midland.

C. H. Paris

A. W. Duke, supervisor on the Pennsylvania, with headquarters at Downington, Pa., whose promotion to division engineer, with headquarters at Cincinnati, Ohio, was reported in the July issue, was born on August 28, 1884, at Hewlett, Va. He was educated at the University of Pennsylvania and entered railway service on June 7, 1907, as a rodman on the Tyrone division of the Pennsylvania, later being transferred to Altoona, Pa. He was promoted to transitman in the office of the chief engineer maintenance of way at Philadelphia on July 1, 1913, and to assistant supervisor, with headquarters at Osceola, Pa., on September 1, 1913. He served in this capacity at Osceola and Brownsville, Pa., and as main line assistant supervisor at Tyrone, Pa., and Huntingdon until May 16, 1919, where he was promoted to supervisor, with headquarters at Millersburg, Pa. He was promoted to main line supervisor, with headquarters at North Philadelphia, on July 21, 1921, and to division engineer, with headquarters at Logansport, Ind., on March 1, 1923. On June 1, 1925, due to changes occasioned by the consolidation of the Northwest and Southwest regions he resumed the duties of supervisor, with headquarters at Downingtown, Pa., which position he was holding at the time of his recent promotion.

A. W. Duke

George H. Wells, whose appointment as chief engineer of the Georgia, Florida & Alabama, with headquarters at Bainbridge, Ga., was announced in the June issue of *Railway Engineering and Maintenance,* was born on October 25, 1886, in Chicago, and graduated from the University of Virginia in 1911. He entered railway service in April, 1912, as a rodman on the Florida East Coast, which position he held until May, 1913, when he was appointed a draftsman on the Central of Georgia. He held this position until January, 1914, when he was appointed successively to the positions of assistant engineer maintenance of way, assistant engineer valuation and assistant engineer of the Macon division. From June, 1918, to December, 1918, he served in the United States Army as first lieutenant of engineers, after which he returned to the service of the Central of Georgia as assistant engineer, on the Columbus division, which position he held until January, 1920, when he was appointed assistant trainmaster. In February, 1921, he was appointed assistant engineer valuation, which position he held until July, 1921, when he was appointed land appraiser on the Wabash. In April, 1923, he returned to the Central of Georgia as assistant engineer in the bridge and building department which position he held until April, 1924, when he was appointed resident engineer on grade revision, in which capacity he was serving when he was appointed chief engineer of the Georgia, Florida & Alabama.

Track

Charles Vogel has been promoted to acting roadmaster on the First division of the Oregon-Washington unit of the Union Pacific.

Joseph Schlarman, section foreman on the Los Angeles & Salt Lake unit of the Union Pacific at Elgin, Nev., has been promoted to roadmaster on the Los Angeles division.

Fred Hunter has been appointed roadmaster on the Missouri-Kansas-Texas, with headquarters at Denison, Tex., to succeed **L. E. Willis,** whose promotion is noted in another column.

W. Carroll, who has been on sick leave on account of personal injury since June, 1924, has resumed his duties as roadmaster on the Saskatoon division of the Canadian National, with headquarters at Saskatoon, Sask.

F. W. Armistead, assistant engineer on the Illinois Central, with headquarters at Chicago, has been promoted to roadmaster of the Indiana division, with offices at Mattoon, Ill., succeeding **C. W. Lentz,** whose appointment as trainmaster is noted elsewhere.

Correction.—A. H. Hobart, roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Milbank, S. D., has been transferred to Elgin, Ill., succeeding **W. A. Moberly,** who takes Mr. Hobart's place at Milbank. This transfer was incorrectly stated in *Railway Engineering and Maintenance* for July, page 294.

Henley Bell, assistant engineer in the office of the division engineer of the New York Central, Ohio Central lines, with headquarters at Charleston, W. Va., has been promoted to supervisor, with headquarters at Hobson, Ohio, succeeding **H. G. Snyder,** who has been transferred to Columbus, Ohio, to replace **P. B. Welsh,** deceased.

The position of general roadmaster on the Kansas City Southern and the Texarkana & Fort Smith at Texarkana, Tex., has been abolished and **G. T. Anderson,** who has occupied that position, has been appointed district roadmaster, with headquarters at Spiro, Okla., where he succeeds **A. M. Spyres,** who has been transferred to Shreveport, La., in the place of **P. J. McCarthy,** whose appointment as assistant engineer is noted elsewhere in this issue.

A. W. Bahr, whose appointment as roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Austin, Minn., was reported in the July issue, was born on January

13, 1893, at Augusta, Minn., and entered railway service as a section laborer on the Chicago, Milwaukee & St. Paul in April, 1913, at that place. He was promoted to section foreman at Roscoe, S. D., on July 27, 1918, where he remained until his recent promotion, with the exception of the season of 1925 when he had charge of a rail laying gang on the Aberdeen division.

C. I. Van Arsdalen, whose promotion to supervisor on the Illinois Central with headquarters at Carbondale, Ill., was reported in the July issue, was born on July 31, 1889, at New Castle, Del., and graduated from the Delaware State University in 1911. He entered railway service on July 5, 1911, as rodman in the maintenance department of the Illinois Central at Freeport, Ill., and was promoted to instrumentman on maintenance, construction and valuation on September 1, 1912. On February 10, 1917, he was promoted to resident engineer on construction and served in that capacity until March 1, 1923, when he became assistant engineer, with headquarters at Dubuque, Iowa, being transferred to Carbondale, Ill., on May 11, 1924. He was promoted to acting supervisor on the St. Louis division on November 1, 1924, in which position he remained until January 1, 1925, when he resumed his duties as assistant engineer, which position he was holding at the time of his recent promotion.

J. W. Zittelmier, whose promotion to supervisor of the Minneapolis & St. Louis, with headquarters at Ft. Dodge, Iowa, was published in the June issue, was born on December 12, 1899, at Washburn, Ill., and entered railway service in 1914 as a section laborer with the Chicago & Alton, and continued in that capacity until July 22, 1917. On the latter date he was employed in an industrial plant as a machine operator, which position he held until November 1, 1920, when he entered the service of the Peoria & Pekin Union. In the spring of 1921 he returned to his position as a machine operator and on September 1, 1921, he entered the service of the Minneapolis & St. Louis as a section laborer at Bartlett yard, Peoria, Ill., which position he held until February 5, 1923, when he was promoted to section foreman at Middle Grove, Ill. On August 1, 1925, Mr. Zittelmier was promoted to yard foreman at Bartlett yard, which position he held until his recent promotion to supervisor of track.

W. L. Clifton, whose promotion to roadmaster on the Union Pacific, with headquarters at Columbus, Neb., was reported in the July issue, was born on April 20, 1886, at Newark, Mo., and entered railway service on the Toledo, Peoria & Western on April 1, 1900. He entered the service of the Chicago, Rock Island & Pacific in August, 1907, and since that time to October, 1920, has been section foreman and extra gang foreman on that and other roads as follows: Chicago, Rock Island & Pacific until August 15, 1915; Chicago, Burlington & Quincy, August 15, 1915, to May 1, 1917; Denver & Salt Lake, May 1, 1917, to December 1, 1917; Denver & Rio Grande, December 10, 1917, to November 1, 1918. From November 1, 1918, to October, 1920, he was general foreman for the Utah Construction Company. He entered the service of the Union Pacific on October 10, 1920, and on April 15, 1926, was promoted to acting roadmaster, with headquarters at Kearney, Neb., which position he was holding at the time of his recent promotion.

R. C. Crew, assistant supervisor on the Pennsylvania, with headquarters at Huntingdon, Pa., whose promotion to supervisor, with headquarters at Struthers, Pa., was noted in the June issue, was born on March 29, 1893, and was educated at Swarthmore College. He entered railway service on June 16, 1913, as a rodman on the Pennsylvania at Jersey City, N. J., and on June 1, 1917, was promoted to transitman in the office of the chief engineer of maintenance of way at Philadelphia, Pa. On October 26, 1917, he was promoted to assistant supervisor on special duty in the same office. On November 1, 1917, he was furloughed for military service and from that date until September 8, 1919, spent most of his time in the Railway Transportation Corps of the A. E. F. in France. He returned to service on the Pennsylvania on September 8, 1919, as an assistant supervisor on the Atlantic division, with headquarters at Camden, N. J., and served in that capacity successively at Trenton, N. J., Wilkes Barre, Pa., and Huntingdon, which position he was holding at the time of his recent promotion.

Homer Pryor, assistant supervisor on the Pennsylvania, has been promoted to supervisor on the Indianapolis division, with headquarters at Frankfort, Ind., succeeding **S. E. Oglesby,** who has been transferred to the St. Louis division, with headquarters at Brazil, Ind., in place of W. H. Byrkit, who has been assigned to other duties. **J. B. Hill** has been appointed assistant supervisor to succeed Mr. Pryor. **E. L. Oberkiser,** yard foreman at Ft. Wayne, Ind., has been promoted to supervisor on Sub-Division No. 4 of the Western region of the Pennsylvania, with the same headquarters, succeeding **A. C. Knight,** who has been transferred to Sub-Division No. 1, with headquarters at Mansfield, Ohio, in place of **T. B. Metcalf,** who has been assigned to other duties. Mr. Oberkiser was born on April 1, 1889, at Columbia City, Ind., and entered railway service as a trackman on the Pennsylvania on April 1, 1907, with which road he has been continuously with the exception of the period during the World War, when he was sergeant and acting first sergeant during ten months' service overseas with the Rainbow Division. He was promoted to section foreman at Columbia City, Ind., on April 1, 1912, and was later transferred to Ft. Wayne, where he was serving when he entered military service. He resumed his duties as foreman at Ft. Wayne on his return to civil life in May, 1919, and was occupying that position at the time of his recent promotion.

Nels Johnson has been appointed division roadmaster on the Montana division of the Great Northern, with headquarters at Havre, Mont., succeeding **A. Mitguard. H. Shapleigh** has been appointed roadmaster on the First district, of the Butte division, with headquarters at Great Falls, Mont., in place of **J. E. Campbell,** who has been transferred to the First district of the Cascade division, with headquarters at Tye, Wash., succeeding **Joseph Goulden,** who has been assigned to other duties. **Calvin Hankins** has been appointed roadmaster on the Fifth district of the Butte division, with headquarters at Judith Gap, Mont., succeeding **A. M. Bean,** who has been granted a 30-day leave of absence. Mr. Johnson was born in Sweden on August 31, 1882, and entered railway service in April, 1902, as a section laborer on the Great Northern. In March, 1904, he was promoted to foreman and served as section and extra gang foreman until September, 1911, when he was promoted to assistant roadmaster on the Butte division. He was promoted to division roadmaster of the Marcus division in December, 1917, being transferred to the Spokane division in July, 1919, where he served until September, 1924. He was out of railway service from September, 1924, to May, 1925, when he was appointed a section foreman on the Illinois division of the Chicago, Milwaukee & St. Paul, which position he was holding at the time of his recent appointment as roadmaster.

Bridges and Buildings

Lloyd Castagneto has been promoted to supervisor of bridges and buildings on the Second district of the Idaho division of the Oregon Short Line unit of the Union Pacific, with headquarters at Nampa, Idaho, succeeding **D. T. Wells,** who has retired.

Water Service

E. J. Lang, water service foreman on the Union Pacific at Denver, Colo., has been promoted to general water service foreman on the Colorado division.

Purchasing and Stores

J. L. Higgins, purchasing agent of the Kansas, Oklahoma & Gulf, with headquarters at Muskogee, Okla., has been appointed also puchasing agent of the Midland Valley.

E. E. Bashford, vice-president and assistant treasurer of the National Railways of Mexico, with headquarters at New York, will hereafter attend to the purchasing department

activities of that company in that city, which work formerly came under the jurisdiction of **F. P. De Hoyos**, general agent, New York.

E. V. Purdy has been appointed division storekeeper of the Southern Pacific Lines in Texas and Louisiana, with headquarters at Austin, Texas, a newly created position.

W. H. Taylor has been appointed reporting storekeeper on the Southern division of the Pennsylvania, and **M. L. Henderson** has been appointed storekeeper at Wilmington, Del.

D. W. Metzdorf, acting general storekeeper of the Alaska Railroad, has been appointed general storekeeper, with headquarters at Anchorage, Alaska, reporting to the general manager.

W. J. Kelleher, assistant to the president and purchasing agent of the Alabama & Vicksburg, with headquarters at New Orleans, La., has been appointed division storekeeper of the Illinois Central, with the same headquarters, succeeding **I. S. Fairchild**, who has retired on a pension.

Arthur C. Simmons, whose promotion to purchasing agent of the Chicago Great Western, with headquarters at Chicago was noted in the July issue, was born on January 1, 1890, at Chicago, and entered railway service in May, 1908, on the Chicago Great Western. His service has been continuous on that road, he having held various positions in the operating, engineering and purchasing departments.

Obituary

Patrick B. Welsh, supervisor on the New York Central, Ohio Central lines, with headquarters at Columbus, Ohio, died on May 22. Mr. Welsh was born on April 15, 1858, near Milford Center, Ohio, and entered railway service as a track foreman on the Zanesville & Western (now a part of the Ohio Central lines of the New York Central), on November 1, 1891, serving in this capacity until August 3, 1902, when he was promoted to general foreman of the Hocking Valley yards at Columbus, Ohio. This position was abolished on April 9, 1903, and he resumed his former position as foreman of the yards at Corning, Ohio. On July 31, 1903, he entered the service of the Cleveland, Cincinnati, Chicago & St. Louis as foreman of the West Columbus yards, remaining in this position until February 14, 1910, when he was appointed track supervisor on the Zanesville & Western, with headquarters at Fultonham, Ohio. On June 1, 1913, he was transferred to the Toledo & Ohio Central, with headquarters at Columbus, Ohio, in which position he was serving at the time of his death.

S. B. Fisher, consulting engineer of the Missouri-Kansas-Texas and formerly chief engineer, died on July 8 at Parsons, Kan., after a brief illness due to heat prostration. Mr. Fisher was born on October 24, 1846, at Cherry Fork, Ohio, and was educated at Washington and Jefferson College. He entered railway service in 1873 as a chainman on the Pennsylvania and remained with that road until 1885, working through the various grades in the engineering department to assistant engineer. From 1885 to 1890 he was chief engineer of the Milwaukee & Northern (now a part of the Chicago, Milwaukee & St. Paul), and from 1890 to 1892 he was chief engineer of the St. Paul, Minneapolis & Sault Ste. Marie, with headquarters at Minneapolis, Minn. He became chief engineer of the Everett & Monte Cristo in 1892 with headquarters at Everett, Wash., where he remained until 1895. He entered the employ of the Missouri-Kansas-Texas on June 1, 1895, and his promotion to assistant chief engineer on December 1, 1895, was followed by his promotion to chief engineer in May, 1896. In December, 1912, he was made chief engineer of construction and later was made chairman of the valuation committee, in which capacity he served until March 1, 1916, when he was made consulting engineer.

The seventy-fifth anniversary of the Missouri Pacific lines was celebrated at St. Louis, Mo., on Saturday, July 10, when the presentation of "Service; a Pageant of Progress" at the stadium of Washington University was followed at 11:30 p. m. by a birthday banquet at the Chase hotel.

Construction News

The Atlantic Coast Line has awarded a contract to the Ogle Construction Company, for the construction of three 500-ton coaling stations at Montgomery, Ala., Albany, Ga., and Palatka, Fla. A contract has also been awarded to the Ogle Construction Company for the construction of a 300-ton reinforced concrete coaling station at Ocala, Fla., this project to include also the erection of an electrically operated cinder plant.

The Baltimore & Ohio has awarded a contract to the Jennison Wright Company, Toledo, O., for the installation of a wood block floor in the first unit of its new fruit terminal in that city at an estimated cost of $39,000. A contract for rolling doors for the same structure, to cost approximately $35,000, has been awarded to the J. G. Wilson Corporation, Philadelphia. A contract has been awarded to the Hughes Foulkrod Company, Philadelphia, for the construction of a private sales building and cold storage warehouse, comprising the second unit of the perishable products terminal which this company and the Reading are building in Philadelphia. The building will be of reinforced concrete construction, 90 ft. wide and 900 ft. long with an 8-ft. concrete platform on one side. Provision will be made for heating the unloading platforms in cold weather. The cold storage warehouse will be 8 stories high, providing 1,300,000 cu. ft. of storage space. This building will be leased for 25 years to Horace P. Serrill of Philadelphia, who will maintain and operate it.

The Canadian National is preparing for the construction of a passenger station at Kamloops, B. C. Bids for the work will soon be requested.

The Central of Georgia has awarded a contract for the construction of a station at Fort Benning, Ga., to cost approximately $15,000 to the Claussen-Lawrence Construction Company, Augusta, Ga.

The Central of New Jersey has awarded a contract to John Anderson for the construction of concrete decks, back walls, fascias, waterproofing, railings and similar work on bridges over Hudson County Boulevard and over Avenue "A," Bayonne, N. J., to cost approximately $72,780.

The Chesapeake & Ohio has awarded a contract to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the installation of water treating facilities at Raleigh, W. Va.

The Chicago Great Western has prepared plans for the construction of a one-story enginehouse at Chicago which is estimated to cost $12,000.

The Chicago, Milwaukee & St. Paul has awarded a contract to Bentley Brothers, Inc., Milwaukee, Wis., for the construction of a new passenger station at La Crosse, Wis. This station will be a two-story structure of brick construction with stone trim and will cost approximately $100,000. The entire project, including track changes and auxiliary facilities, will involve a total outlay of about $300,000.

The Chicago, Rock Island & Pacific awarded a contract to Walter H. Denison, Cushman, Ark., for the grading of a portion of a new line from Liberal, Kan., to Amarillo, Tex.

The Erie is reported as contemplating an early start on the construction of its proposed new freight terminal at Jersey City, N. J. The new development will include warehouses and cold storage facilities.

The Great Northern has awarded a contract to W. T. Butler for the construction of a power substation at Snohomish, Wash., to be used in connection with the electrification of the line in western Washington. Another power substation will be constructed at Tumwater, Wash.

The Mobile & Ohio has awarded a contract to John Marsch, Inc., Chicago, for grade reduction work near Ava, Ill., on the Cairo-St. Louis division.

The Michigan Central has prepared plans for the construction of a coaling station at Waterford, Ont.

The Missouri Pacific will soon receive bids for the construction of a one-story machine shop and an addition to the enginehouse at Nevada, Mo., at an estimated cost of $130,000.

The New York Central has awarded contracts for new work as follows: To the John Johnson Construction Company, Buffalo, N. Y., for grading and paving preliminary to the construction of a passenger station at Buffalo at an estimated cost of $600,000; to the Walsh Construction Company, Syracuse, N. Y., for four tracking between New Durham and West Englewood, N. J., at an estimated cost of $500,000; to the Lyons-Slattery Company, Inc., New York, for the reconstruction of a bridge at Fordham, N. Y., estimated cost, $285,000; to the Edw. J. Duffy Company, Weehawken, N. J., for paving, drainage, etc., at Port Morris, N. Y., estimated cost, $60,000; and for alterations and extensions to platforms, foundations, etc., at Highbridge, N. Y., estimated cost, $30,000; to Wm. M. Ballard, Inc., Syracuse, N. Y., for the extension of seven stalls in the DeWitt enginehouse, estimated cost, $50,000, and for additions to the coaling plant at Wayneport, N. Y., at an estimated cost of $25,000. A highway crossing over this company's tracks at the Second avenue and Aikin street crossing in Rensselaer, N. Y., was proposed to the Public Service Commission of the state. The plan calls for a bridge carrying the highway over the tracks of the New York Central, the Boston & Albany and East street. The structure would be 600 ft. long, of eight spans, with a 30 ft. roadway and a 5 ft. sidewalk on the south side. The estimated cost, exclusive of land and damages, is $430,000.

The New York, New Haven & Hartford has authorized the construction of a seven-track classification yard at its Harlem river, New York, terminal, at an estimated cost of $120,000.

The Oregon Short Line unit of the Union Pacific has awarded a contract to the Utah Construction Company, Ogden, Utah, for the construction of 7.2 miles of main line from Shoshone, Idaho, to Dietrich, which will have an eastbound maximum grade of 0.5 per cent. The new line is not directly parallel to the present main line, but the latter will be retained, providing double track between Shoshone and Dietrich. The project is estimated to cost approximately $600,000.

The Pennsylvania has awarded a contract to the T. J. Foley Company, Pittsburgh, for grading and track work for a storage yard on its South Massillon branch, Massillon, Ohio, at an estimated cost of $60,000. A contract has been awarded to the same company for grading, masonry and track work for an eastward freight track at Holliday's Cove, W. Va.; estimated cost, $80,000. A contract has been awarded to A. Guthrie & Co., Inc., St. Paul, Minn., for grading and masonry for additional tracks in its Grogan yard, Columbus, Ohio, and the extension of its Joyce avenue viaduct in the same city; total cost, $90,000. Officers of this company have informed the city of Norfolk, Va., that it will proceed at once in the construction of extensive improvements at Little Creek Terminal, near that city, at an expense of $1,500,000. Grade crossing elimination at Passayunk avenue, Philadelphia, involving 15 crossings and an expenditure of approximately $1,850,000 has been authorized and contracts for the work awarded to Sinclair & Grigg, Philadelphia.

The Rio Grande, Micolithic & Northern has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line of 6.4 miles from Micolithic, Hudspeth county, Tex., in a general northerly direction to a connection with the Southern Pacific. C. L. Kerr, of Houston, Tex., is president.

The St. Louis-San Francisco has awarded a contract to S. M. Bate & Co., Kansas City, Mo., for the construction of a one-story brick and hollow tile passenger station at Fayetteville, Ark.

The Southern has awarded a contract to Dwight P. Robinson & Co. for the design and construction at Chattanooga, Tenn., of a complete locomotive terminal consisting of reinforced concrete roundhouse, machine shop, boiler, smith and tank shop, wash and locker buildings, storehouse, office and oil house, power house, necessary grading and miscellaneous yard structures. This company has awarded contracts to the Virginia Bridge & Iron Co., Roanoke, Va., for bridge work at various points on its lines west at a total estimated cost of $180,000.

The Southern Pacific is reported to be making surveys in contemplation of the construction of a line from a point at the mouth of the Nehalem river, near Wheeler, Ore., to the mouth of the Columbia river. This company and the Central Pacific, which it operates under lease, have been authorized by the Interstate Commerce Commission to construct a 4.7-mile branch line northeasterly from Rupert, Yuba county, Calif., at an estimated construction cost of $109,315. The construction of a viaduct over Sixteenth street at Klamath Falls, Ore., has been authorized.

The Wabash contemplates the construction of a 50-ft. by 145-ft. addition to the car shop at Decatur, Ill., which will double the car repair facilities at that point.

The Wenatchee Southern has withdrawn its recent application to the Interstate Commerce Commission for an extension of time in which to begin and complete construction of its proposed line in Washington, under the certificate issued by the commission on July 14, 1924, and a contract has been awarded to the Railway Construction Company, Seattle, Wash., for the construction of a line from Wenatchee, Wash., to Kennewick, a distance of approximately 100 miles. The cost of the construction is estimated at $2,000,000.

Equipment and Supplies

The Great Northern has ordered 10,000 tons of rails from the Illinois Steel Company.

The Delaware, Lackawanna & Western has ordered 18,000 tons of rails from the Bethlehem Steel Company.

The Seaboard Air Line has ordered 10,000 tons of rails from the United States Steel Corporation.

The St. Louis-San Francisco has ordered 12,000 tons of rails from the United States Steel Corporation.

The Norfolk & Western has ordered 37,500 tons of rails from the United States Steel Corporation and 16,500 tons from the Bethlehem Steel Company. This company also is inquiring for 17,000 kegs of spikes and 300,000 track bolts.

The Great Northern has ordered 10,000 tons of rails from the Illinois Steel Company, 3,000 tons from the Inland Steel Company and 7,000 tons from the Bethlehem Steel Company. The order includes 3,000 tons of track fastenings.

Bermuda is soon to have its first railway, the construction of an electric line having begun on June 21. Automobiles are not permitted on the island and the only means of transportation up to the present time has been horse-drawn vehicles.

The Class I railroads of the United States made a reduction of over $35,000,000 in the stocks of materials carried by them during 1925, the total value at the close of 1924 amounting to $559,295,832, compared with $523,627,546, at the close of 1925. This is the smallest amount since 1917 when the value of the stocks on hand amounted to $502,986,042.

All operations have been suspended on the Springfield-Lock Haven branch of the Chicago, Peoria & St. Louis in compliance with a court order issued on July 1, efforts to raise money from interested patrons for the purchase and operation of the road having been unsuccessful. Operations will be continued on the Jacksonville-Havana branch as the patrons on this line have subscribed practically the amount asked of them.

The average cost of coal used as fuel for road locomotives in freight and passenger train service and charged to operating expenses was $2.64 per ton in the first four months of this year, according to the Interstate Commerce Commission's monthly bulletin of railroad fuel statistics. This compares with $2.81 in the corresponding period of last year. The cost of fuel oil averaged 2.9 cents per gallon.

Supply Trade News

General

The Mississippi Valley Structural Company will construct a fabricating plant at Chicago, to cost about $750,000.

A. O. Norton, Inc., has opened an office at San Francisco, Calif., and will be directly represented by **Harry H. Hale,** who has charge of the Pacific coast territory.

The American Fork & Hoe Company, Cleveland, Ohio, has appointed the William H. Ziegler Company, Inc., Minneapolis, Minn., its northwest representative.

The Graybar Electric Company, New York, has opened a new branch office and warehouse at Commerce and Buncombe streets, Asheville, N. C. **H. H. Hix,** formerly of the Atlanta, Ga., branch of the company, is in charge of the new branch.

The Maintenance Equipment Company, Railway Exchange building, Chicago, has been appointed exclusive sales agents in the United States for the sale of the Mack reversible switch point protector. The manufacture of this device will be handled by the Fleming Company, successor to the J. R. Fleming & Sons Company, Scranton, Pa.

Personal

W. J. Hammond, who has been assistant traffic manager of the Inland Steel Company during the last eight years, has been promoted to traffic manager to succeed the late **C. L. Lingo.** Mr. Hammond was associated with the Illinois Central and the Union Pacific prior to entering the service of the Inland Steel Company.

Arthur Fletcher, representative of Mudge & Co., Chicago has been promoted to assistant sales manager, with headquarters at Chicago. He was born on March 4, 1890, and in 1908 entered business as an architectural draftsman. In 1912 he entered the employ of the Canadian National as a draftsman and assistant to the resident engineer at Oshawa, Ont. In 1915 he resigned to become connected with an industrial concern in Chicago and two years later entered the employ of the Chicago, Rock Island & Pacific in the mechanical department. He held several positions including those of statistician and chief clerk to the mechanical engineer, and on December 1, 1925, resigned to become a representative of Mudge & Co., which position he has held until his recent promotion.

Arthur Fletcher

C. W. Fisher, engineering sales representatives of the McMyler Interstate Company, Cleveland, Ohio, has been appointed district sales manager in charge of the Chicago branch.

George E. Watts, formerly with the Duff Manufacturing Company, Pittsburgh, Pa., has joined the Timken-Detroit Axle Company, Detroit, Mich., as a railway representative, with his headquarters in Atlanta, Ga.

Charles W. Harris, of San Francisco, Cal., is building up a sales organization for the Dunn Painting Machine Company, of the same city. **Robert S. Weintraub,** formerly with the Weinstock-Nichols Company, San Francisco, has been appointed special representative for the Dunn Painting Machine Company, with headquarters at San Francisco.

C. L. Walker, formerly assistant manager of the Gary plant of the American Bridge Company, has been appointed manager of the Walter Bates Steel Corporation, Gary, Ind. **James S. Marlin,** formerly structural and transmission line engineer of the Duquesne Light Company, Pittsburgh, Pa., has been appointed chief structural engineer, and **E. L. Gemmill,** formerly chief structural engineer of the Blaw Knox Company at Pittsburgh, has been appointed sales manager of the tower division.

Trade Publications

Strength of Southern Pine. In an eight-page bulletin issued by the Southern Pine Association, facts are presented concerning the strength of Southern yellow pine. This is given in the form of tables of recommended working stresses and in a general discussion pointing out the advantages of this material as a structural timber.

Motor Cars. The Fairmont Railway Motors, Inc., has issued a six-page folder describing the various types of inspections, section and extra gang cars which it manufactures. All of the different types are illustrated and full descriptive data are given. Attention is called to the Fairmont track dynamometer for testing motor car performance.

Sullivan Electric Portable Hoists. The Sullivan Machinery Company has issued Bulletin No. 76-G, of 12 pages calling attention to the advantages of the Sullivan electric portable hoists, which are made in three types: standard single drum, large single drum and double drum. Illustrations of these hoists in construction work and other uses are shown, together with a table showing full data for each of the types.

The C. F. Pease Company, Chicago, has just issued a 371-page catalog bound in fabricoid which lists, describes and illustrates a complete line of materials and equipment used in drawing room work and surveying. It covers papers, tracing cloth, drawing instruments, inks, drafting tables and surveying instruments and rods as well as tapes and chains. Forty-five pages are devoted to blue print room equipment including the latest styles of blue print machines.

Lumnite Cement.—A four-page folder issued recently by the Atlas Lumnite Cement Company, New York, features the use of Lumnite quick-hardening cement in the construction of the large concrete supporting cylinders in the U. S. Navy pier at the Puget Sound navy yard, Bremerton, Wash. The bulletin also contains a comprehensive statement of the character and qualities of Lumnite cement and the results of several tests illustrating the compressive and tensile strength of concrete and mortar made with this material.

Sheffield Stand Pipe.—A valuable bulletin of 48 pages has been issued by Fairbanks Morse & Company, Chicago, devoted to an exposition of the requirements of an effective standpipe for the delivery of water to locomotives and the manner in which these requirements are fulfilled by the Sheffield standpipe. The text opens with a discussion of water hammer and its relation to standpipe operation, followed by a description of the Sheffield main and release valves in their relation to water hammer, together with descriptions of the various types of Sheffield standpipes. A specially valuable feature of this bulletin, which is gotten up in an attractive form, is a series of charts for determining standpipe capacities, taking into account the variables of flow head, size of standpipe and length and size of the water supply pipe. These charts should be of marked value to men in railway service who are concerned with this problem. Other features of the bulletin are a description of the Sheffield oil standpipe, some data on tank fixtures and several pages of engineering data and formulæ relating to pipe lines, pumps, water flow equivalents, fixtures, contents of cylindrical tanks, etc.

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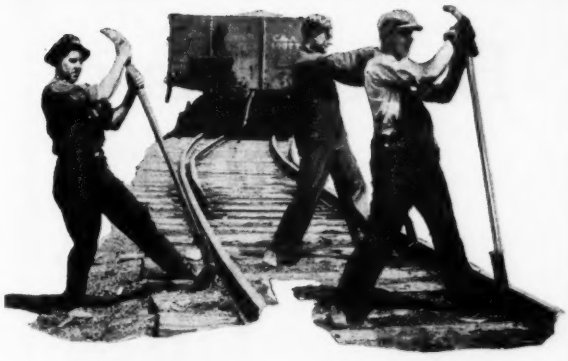

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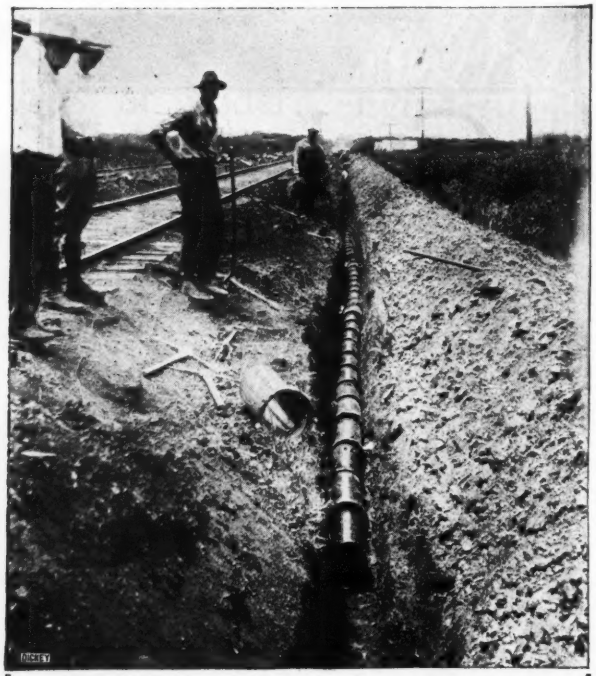

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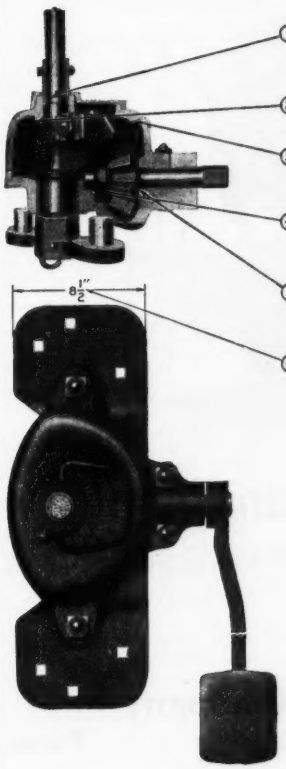
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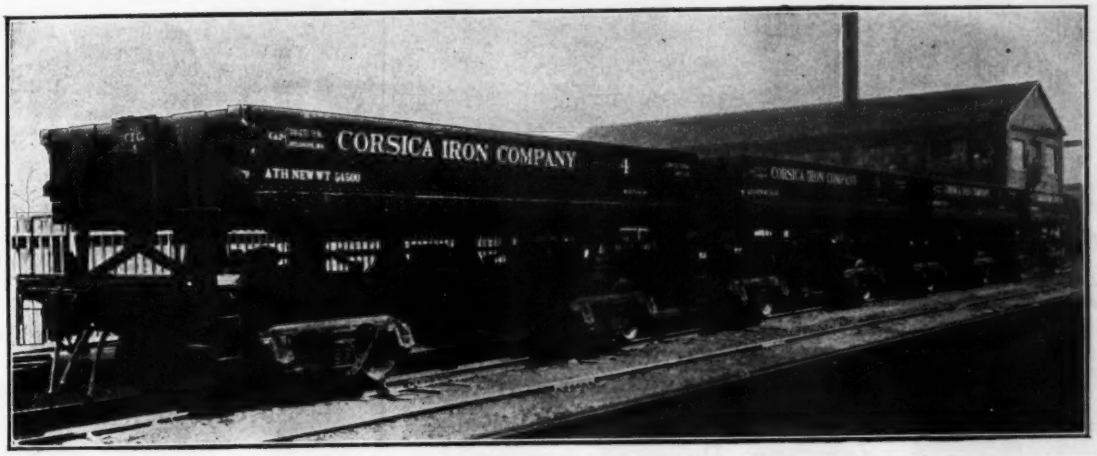

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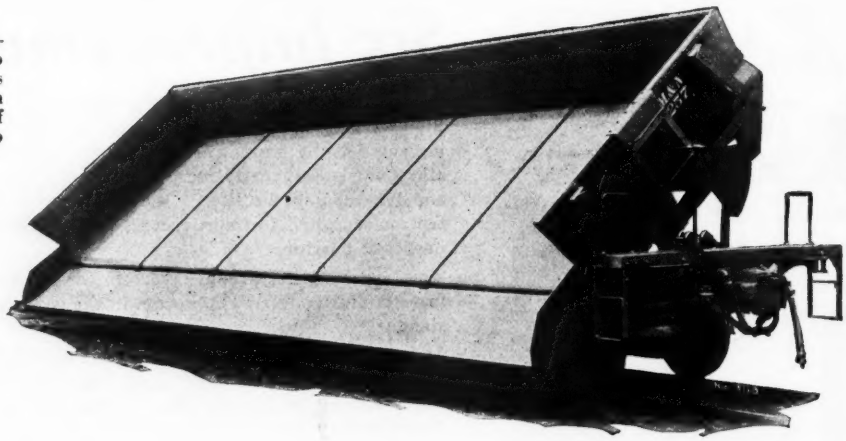

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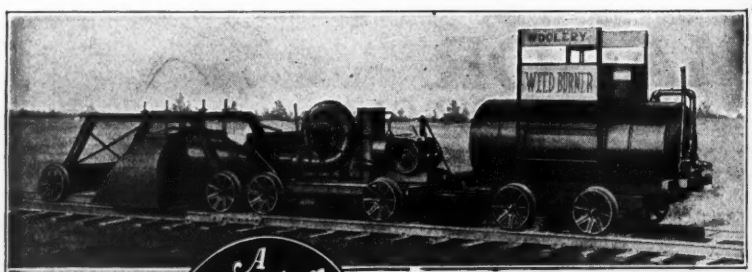

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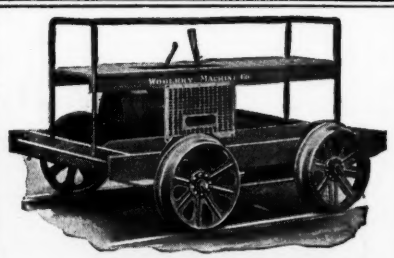

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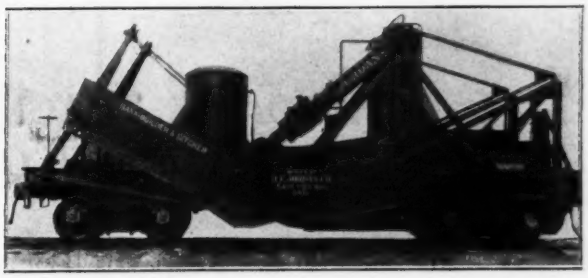

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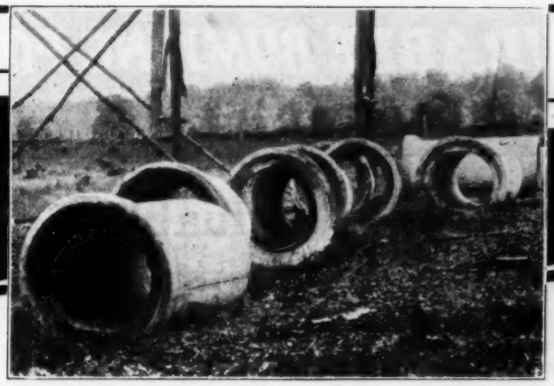

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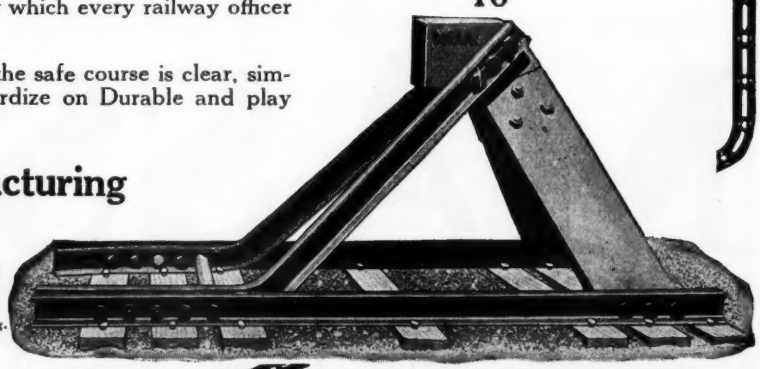

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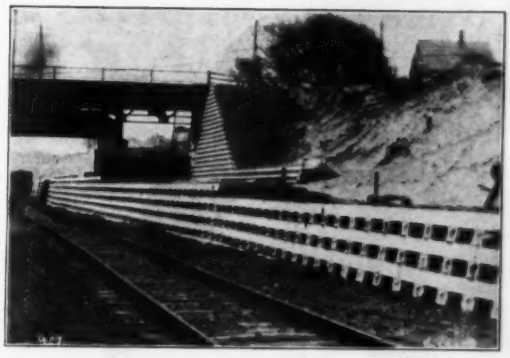

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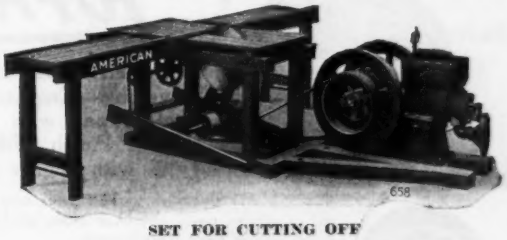

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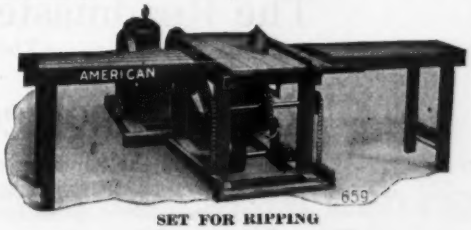

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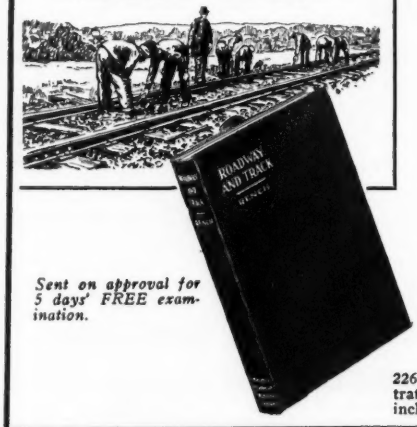

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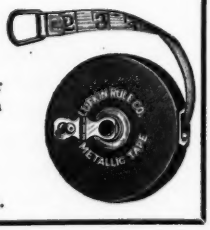

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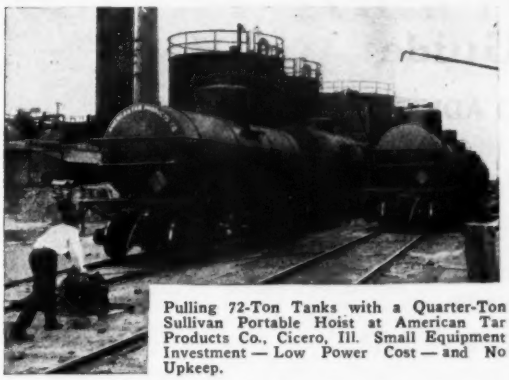

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We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

There is no investment that a railroad can make which will yield greater dividends, if it operates in a hard water district, than to invest in AMERICAN LIME-SODA WATER SOFTENERS.

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We are qualified by organization and experience to give you service. Write for our literature.

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FAIRHILL P. O. PHILADELPHIA, PA.

Specialists for twenty-four years in Railroad
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Cast Iron Pipe and Fittings for all purposes
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General Offices
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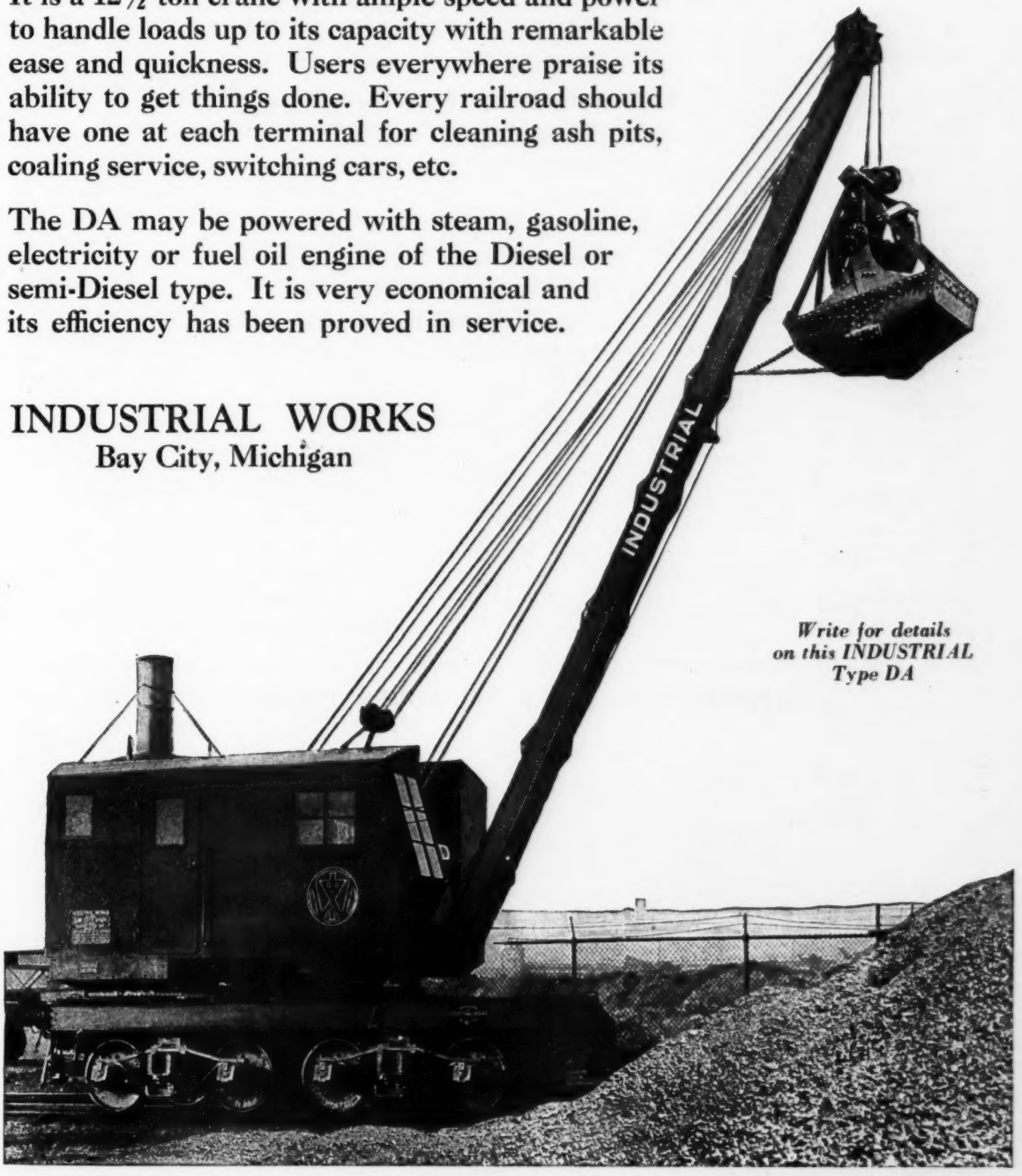
DUST OFF YOUR HANDLING DREAMS!
Realize them with an INDUSTRIAL

FOR light, fast service the INDUSTRIAL type DA locomotive crane has no equal. It is a two-speed outfit with all functions controlled by friction clutches. Speed gears can be changed while the crane is moving. It is as flexible as an automobile. It is a 12½ ton crane with ample speed and power to handle loads up to its capacity with remarkable ease and quickness. Users everywhere praise its ability to get things done. Every railroad should have one at each terminal for cleaning ash pits, coaling service, switching cars, etc.

The DA may be powered with steam, gasoline, electricity or fuel oil engine of the Diesel or semi-Diesel type. It is very economical and its efficiency has been proved in service.

INDUSTRIAL WORKS
Bay City, Michigan



Write for details on this INDUSTRIAL Type DA

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3234 Track Jacks

and only $43.62 worth of repairs

From March, 1923, to June, 1926 the Baltimore & Ohio R. R. Co. purchased 3234 Simplex Track Jacks and during this period they purchased only $43.62 worth of repairs.

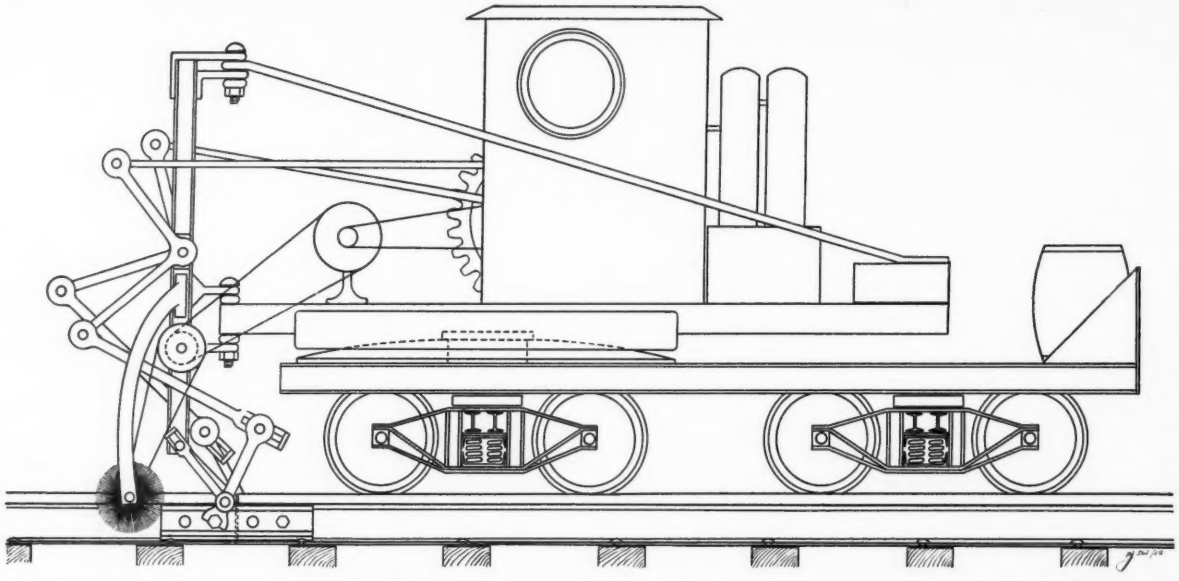
Their cost of these repair parts is only one one-thousandth (1/1000) of the cost of these 3234 Simplex Track Jacks.

The true cost of a Jack is its continuous workable service and man power, both of which the Simplex Jacks distinctly demonstrate.

Simplex — Jacks

the jacks that demonstrate the maximum of power, safety, stability and simplicity.

Templeton, Kenly & Co., Ltd. Chicago



If you could buy a machine like this

Suppose you could buy a bolt tightening machine that was entirely automatic — that detected a loose bolt the instant it became loose — that ran immediately to every loose bolt and tightened it—that got down under snow and ice and was always on the job—that never interfered with traffic—that did the work of all the men you now have engaged in bolt tightening—

You'd buy such a machine, wouldn't you?

Well such a machine is available. It doesn't look like this drawing but it does look like the picture at the bottom of this advertisement. Its name is the Verona Rail Joint Spring. It makes track bolts tight—it compensates instantly for bolt stretch, rust and wear and therefore it *keeps* them tight. Its saving is great enough to justify the purchase of a complicated piece of machinery like this drawing if such machinery could do the work yet its cost is comparatively small.

VERONA TOOL WORKS

Pittsburgh	New York	Chicago
Boston	St. Louis	San Francisco
New Orleans	Washington	St. Paul
Denver	Baltimore	Louisville